UNITED STATES ARMY

AVIATION DIGEST

JULY/AUGUST 1992

Professional Bulletin 1-92-4

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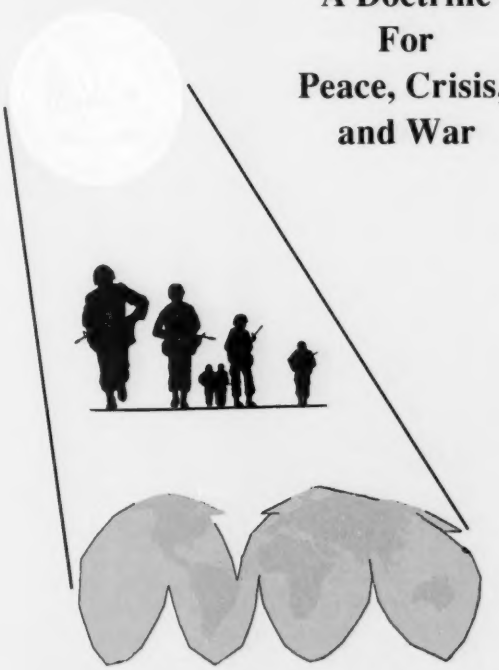
FM 100-5, *OPERATIONS*
THE 1993 REVISION

A Doctrine For Peace, Crisis, and War



AVIATION DIGEST

PROFESSIONAL BULLETIN

1—92—4 • JULY/AUGUST 1992

1 **Army Aviation's Role in Counterdrug Operations,** MG Dave Robinson

3 **Views From Readers**

8 **FM 100-5, *Operations*: A Paradigm for Adaptation,** LTC Michael R. Rampy

14 **Organic Army Aviation in World War II, Part 2: 1944-1946,** Dr. John W. Kitchens

26 **Capabilities and Expectations,** CPT Pete Vozzo

29 **Simulation and Training,** Mr. Herbert C. Pate

33 **Simulators Make Me Sick,** CPT Thomas Willmuth

36 **Sudden Thunder,** SGT Wayne V. Hall

38 **Distributed Training Program,** CPT Charles Pace

40 **The Army Reprogramming Analysis Team,** Mr. Norman H. Svarrer

42 **Those Doggone NOTAMs,** CW3 Ron Toth

44 **NBC Decontamination—Lessons Learned**

48 **Flying High—A Look at Alcohol and Aviation,** SFC Timothy C. Brinkerhoff

54 **The Aircrew Battle Dress Uniform—More Compatible for the Field,** CPT Kenneth R. Keener

56 **Friendly Fire—A Different Look,** 1LT Kenneth B. Moreno

59 **Close Calls,** CW4 John G. Miller

60 **TEXCOM: Test Community Celebrates Aviation Anniversary,** Mr. Robert J. Szersynski

61 **USAASA Sez: Aircraft Call Signs,** Mr. Richard T. Johnson

62 **AVSCOM: Engineer Support Center of Excellence, Directorate of Maintenance**

63 **Aviation Personnel Notes: Aviation Branch Insignia**

64 **ATC Focus: Mystery or Magic?,** Mr. Dave Fonda

65 **Soldiers' Spotlight: Are We Really Qualified?,** SFC Lawrence F. Dunn

Back Cover: **Preview of Upcoming Issues and Event**

Cover: **In 1993, the Army will refocus its doctrine in its new keystone manual, FM 100-5, *Operations*. The author of the lead article addresses the critical role of doctrine in the new strategic era—keeping the peace; meeting the crises of terrorism, insurgency, low-intensity conflict, and counterdrug operations; and training and developing the Army for its primary mission—warfighting.**

Major General Dave Robinson
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The ***U.S. Army Aviation Digest*** is an official Department of the Army professional bulletin (USPS 415-350) published bimonthly under the supervision of the commander, U.S. Army Aviation Center. This publication presents professional information, but the views expressed herein are those of the author not the Department of Defense or its elements. The content does not necessarily reflect the official U.S. Army position and does not change or supersede any information unless otherwise specified. Photos are U.S. Army unless otherwise specified. Use of the masculine pronoun is intended to include both genders unless otherwise stated. Material may be reprinted provided credit is given to the ***Aviation Digest*** and to the author unless otherwise indicated. Publication uses recyclable paper.

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Second class postage paid at Daleville, AL, and additional mailing offices.

Active Army, Army National Guard, and U.S. Army Reserve units receive distribution as outlined in DA Pamphlet 25-33. To complete DA Form 12-99-R, enter form number 12-05-E, block number 0014, and quantity. Also use DA Form 12-99-R for any change in distribution requirements. Army units submit the form to their publications control officer.

Personal copies of the ***Digest*** can be ordered from New Orders, Superintendent of Documents, P.O. Box 371954, Pittsburgh, PA 15250-7954.

POSTMASTER: Send address changes to U.S. Government Printing Office, Superintendent of Documents, ATTN: Chief, Mail List Branch, Mail Stop: SSOM, Washington, DC 20402-9373.

Major General Dave Robinson

Army Aviation's Role In Counterdrug Operations

While the shakeout of the new multipolar world continues, news headlines continue to alert us to the widespread effects that illegal drugs are having on the political structure of legitimate governments around the world. After the Peruvian coup on 11 April 1992, Peruvian President Fujimori dissolved the country's congress and its judiciary system, suspended the country's constitution, and placed dozens of its legislators under arrest in a so-far-successful attempt to confront the challenges from the Maoist Shining Path narco-terrorists.

For centuries Peru's Huallaga Valley has been a major source of coca leaves and ultimately cocaine. It produces 60 percent of the cocaine used in the United States, and has more than 250,000 coca farmers. Coca farming is popular in this region because the coca leaf brings three to four times the cash price of any other crop.

In Panama, high unemployment and the continuing shrinkage of the middle class endanger the more stable parts of that society. Manuel Noreiga, once a trusted friend of the United States, was convicted recently of drug trafficking in a highly publicized trial. Today, Panama remains a major drug transshipment point in the region. Columbia regularly suffers large-scale, military-style attacks on whole sections of the government. In February 1992, Venezuelan army units nearly overthrew President Carlos Andres Perez. The full extent of the narcotics trade involvement in this attempted coup has yet to be determined.

So what do we, as professional soldiers, know of this threat? Do these drug traffickers have a doctrine for their activities? What "operating systems" are at work? More importantly, what can we do about it?

Drug cartels, such as the Medellin and Cali from Columbia, have amassed huge sums of wealth and power. The influence that the cartels represent is a serious security risk to the remainder of the western hemisphere. They infiltrate and corrupt the hearts and souls of the legitimate governments, law enforcement agencies, and the military. They cross every ethnic, social, and financial boundary with near impunity. They hire paramilitary experts to assist them and buy state-of-the-art equipment.

With the collapse of the former Soviet Union, there is a justified concern over the procurement of high-technology weapons systems by these cartels. Forbes magazine reported recently that front-line equipment sells for pennies on the dollar—a MiG-21 Fishbed costs less than $20,000 cash. Soviet officials are selling their high-technology weapons to anyone with hard currency. Who knows what weapons these cartels will have in the future? Because human life holds absolutely no value to them, they kill without regard. When their money and violence cannot control a government, cartels may form coalitions with other insurgent groups. International drug cartels, with their terrorist support structures, are clearly a threat to the national security interests of source, transient, and using nations.

President Bush and the United States Congress intend to challenge and defeat this threat deep (in source nations), close (in-transit and along the U.S. borders), and in the rear (within our borders). The fiscal year 1989 Defense Authorization and Appropriations Act gave the Department of Defense (DOD) three significant missions in the war: lead agency for detecting and monitoring drug smuggling across U.S. borders; planning responsibility for a communications network that integrates U.S. command, control, communications, and intelligence assets dedicated to drug interdiction; and an enhanced support role for the National Guard.

Based upon the DOD's counterdrug role, the Department of the Army published its counterdrug plan in April 1990 to help the State Department, U.S. Customs, the Drug Enforcement Agency, and other national and local law enforcement agencies. Army Aviation has a significant role in this assistance. To fight the ***deep*** battle, Army Aviation is conducting aviation programs, ranging from crop eradication to reconnaissance of traffickers, in five Latin American countries—Bolivia, Belize, Columbia, Guatemala, and Peru. Our aviation officers are helping host nations by providing maintenance, flight instruction, and operational planning

expertise. Army aviation elements also help in the Caribbean region. Their role in the reconnaissance and transportation support to law enforcement agencies has had a significant impact on traffickers' operations.

Another important element in controlling intransit shipments is the U.S. Air Force. For several years, Airborne Warning and Control Systems (AWACS) aircraft have been used to assist drug enforcement agencies in intercepting drug shipments before the shipments reach the U.S. borders.

The "close" battle, along our borders, provides a totally different challenge. As strategist Herman Kahn once wrote, "There are many doors in this world that are not being opened precisely because someone is leaning against them." Our law enforcement agencies have recognized the need to lean on the staggering number of air, land, and sea doors of opportunity available to narco-traffickers. More than 355 million people legally cross U.S. borders annually, in more than 100 million cars and trucks, 220,000 ships, and 635 million aircraft. Traffickers use this tremendous volume of legitimate transportation to smuggle their product into the country.

Army Aviation helps the border patrol and other drug enforcement agencies by conducting surveillance along the border. Operating under federal and state laws, U.S. Army elements help identify persons believed to be involved in the transport of illegal drugs into the United States. One such operation, conducted in September 1991, used AH-64 Apaches from the Sixth Cavalry Brigade in Operation Bush Hog. Operation Bush Hog was designed to interdict illegal drug traffic entering the United States in the area surrounding Laredo, TX. With their sophisticated forward-looking infrared system, the Apaches could identify clearly personnel and equipment illegally entering this country and guide law enforcement officials to the criminals. As a result, many drug traffickers were apprehended by the U.S. border patrol, and trafficking activity dropped off as the word got around that "someone was leaning on the door."

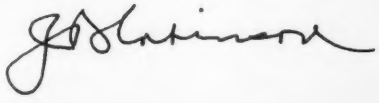
The National Guard's role in the border surveillance mission is far more extensive and consistent than the Active Army's. The border states are establishing a special reconnaissance and interdiction unit using modified OH-58A Kiowas to do nothing but support drug law enforcement agencies. Some may ask, "Why does the National Guard have the major role is this mission and not the active component?" The answer lies in a series of laws, primarily known as Posse Comitatus, that limit the use of federal troops to enforce civil law.

The National Guard also has the primary responsibility for the "rear" war on drugs. Aviation assets support local law enforcement agencies in locating and eradicating illegal drugs being cultivated in the United States. They also conduct airmobile operations of law enforcement agents to and from processing sites. Several states (Kentucky, New York, and Oregon) have established excellent standing operating procedures to ensure missions are efficient, effective, and safe.

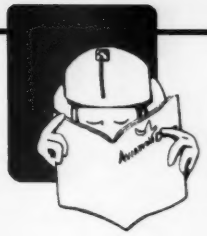
As you can see, Army Aviation in the Total Force has become an indispensable element in this unique combined arms team fighting the war on drugs. As our role expands, the ultimate challenge that confronts commanders and staffs across the Total Army is how to balance the employment of Army Aviation between conventional AirLand Operations and counterdrug operations. The counterdrug mission has become a legitimate, low-intensity conflict, contingency operation that must be won. To help meet this goal, the U.S. Army Aviation Center, Fort Rucker, AL, published the doctrinal white paper "Army Aviation and the National Drug Control Strategy," in November 1990. The paper was designed to serve as a primer for developing, planning, and executing aviation missions in the counterdrug environment.

. . . the ultimate challenge that confronts commanders and staffs across the Total Army is how to balance the employment of Army Aviation between conventional AirLand Operations and counterdrug operations.

We expect that, as aviation becomes integrated more in the deep, close, and rear war on drugs, tactics, techniques, and procedures peculiar to counterdrug assistance will be developed. Army Aviation employed within the doctrinal guidelines outlined in the white paper allows law enforcement agencies to exploit the elements of space and time to hit the drug traffic center of gravity within its area of operation. If you or your organization have not been involved in counterdrug operations, chances are you will be soon. There is no official publication on aviation in counterdrug operations. Meanwhile, the white paper is the only doctrine. If your unit has not received a copy of the white paper, you can get a copy by writing to the following address: Commanding General, U.S. Army Aviation Center, ATTN: ATZQ-TD-DD, Fort Rucker, AL 36362-5263.



VIEWS FROM READERS



Editor:

I read Colonel Tackaberry, Lieutenant Colonel Kelley, and Captain Muir's article "Deep Attack and the Counterartillery Battle" in the January/February 1992 issue of the *U.S. Army Aviation Digest*. It was thought provoking and well received by other light divisions faced with the warfighting challenge.

How the AH-1F Cobras flew to the engagement area (night vision goggles (NVG)) is obvious, but how they engaged the targets is not. "Cache UH-60 (Black Hawk)" rearming tactics, reloading 2.75-inch (70mm) multipurpose submunition (MPSM) rockets, and tube-launched, optically tracked, wire-guided (TOW) missiles were discussed.

While Training Circular (TC) 1-140, "*Attack Helicopter Gunnery*," discusses conducting rocket fire under NVG, it does not address how to conduct TOW fire without illumination. This begs the following questions: Was the 75 percent reduction of the enemy regimental artillery groups (RAGs) and division artillery groups (DAGs) conducted primarily with rockets? If so, this virtue needs to be praised. What part did TOW fire play in the reduction of the RAGs and DAGs? Did the attack battalion take along their own illumination rockets to conduct TOW fire, since the friendly artillery, except for the multiple launch rocket system (MLRS), was out of the engagement area range? Was some other technique of conducting TOW fire at night used?

Over the years, there has been talk of an unofficial (not in TC 1-140) technique of firing TOW from the AH-1F, which involves placing NVG directly into the telescopic sight unit of the AH-1F. If this or some other technique is being used to overcome the inherent weakness of the AH-1F (night TOW fire without artificial illumination), then someone needs to discuss the procedure in the *Aviation Digest*.

Of course, if there were a "glitch" in the computer program during Warfighter 91 that allowed AH-1F TOW fire at night without illumination, and the 7th Infantry Division (Light) (7ID[L]), Aviation Brigade, discovered and capitalized on this inherent weakness, it would make even more interesting reading.

Major Loren D. Porr, Aviation
29ID(L), Aviation Brigade,
Unit Assistor
Aviation Readiness Group
Baltimore, MD

***Response*: Major Porr's comments concerning the effectiveness of the AH-1F to conduct night time deep attacks are well founded. Light divisions must rely on what is essentially a day weapons system to fight and win the deep battle. This creates unique challenges for the light division commander to synchronize all deep battle assets at the right time and place. The 7ID(L) relied on the cover of darkness and an extensive localized suppression of enemy air defense program to ensure the successful penetration of an extensive enemy air defense artillery (ADA) belt and the safe return of the attack helicopter battalion. Although the cover of darkness assists the survivability of the AH-1F equipped attack helicopter force, it negates the effectiveness of the TOW weapons system.**

We relied on the synergistic lethality of battlefield air interdiction (BAI), MLRS fires, and attack helicopters to reduce the enemy artillery groups to 25 percent combat effective. The battle damage results of the attack helicopter battalion alone were not sufficient to meet the destruction criteria. However, the combined effects of all deep battle systems effectively reduced the enemy's artillery and created the conditions to ensure success for the 7ID(L) forces in the close battle.

The commander directed that our AH-1F aircraft conduct deep attacks using a basic load consisting primarily of Hydra-70 MPSM. The attack helicopters also carried 2.75-inch illumination rockets to conduct self-illumination for the TOW missile

as we were beyond the range artillery illumination. The effectiveness and lethality of the Hydra-70 rockets combined with deadly accurate MPSM fires forced the enemy artillery groups to displace. Synchronized BAI completed the destruction of the displaced artillery, effectively reduced his artillery, and achieved the division commander's intent.

Key to the success of the deep attacks was the integration of the OH-58D Kiowa Warrior. The thermal imaging systems on the OH-58D enabled the aviation brigade commander to keep his eyes on the enemy at night from standoff distances. It also enabled the commander to direct accurate MPSM deep fires on enemy artillery and copperhead fires on enemy ADA systems in the vicinity of the forward line of own troops.

Although the simulation system employed by the Battle Command Training Program (BCTP) replicates battlefield results as accurately as possible, there are still several "work arounds" concerning the employment of Army Aviation, particularly at night. The simulation does not accurately replicate night or periods of reduced visibility. It also does not credit attack helicopters with 2.75-inch rocket effects. Rocket fires are replicated as TOW fires from the appropriate ranges. Night or periods of reduced visibility are replicated by decreasing ranges for observation and direct fires as well as reducing weapons effectiveness.

Both attack and assault helicopters face the "hex" problem for holding areas, battle positions, and deep landing zones. Aviation forces must generate sufficient combat power when landing in a "hex" (3km by 3km) occupied by any enemy force and must have sufficient combat forces to engage enemy forces located in the six adjacent "hexes." The computer will return the aviation force to its original assembly area or forward area refueling point (FARP) if insufficient combat power exists or a high-risk option is not selected. In addition, "Jump" FARPs that are not occupied are returned to their original locations.

A light infantry division must always balance the effectiveness of the AH-1F at night versus the risks associated with day flying. Particularly in the 7ID(L), there exists a definitive need for a true night fighting attack helicopter to support light fighters in combat. We have recently fielded the AIM-1/EXL infrared laser aiming light for the 20mm system on our AH-1Fs, enabling our attack helicopters to provide deadly accurate 20mm fires at night. In fiscal year 1994, the 7ID(L) will field 43 armed OH-58Ds to both the attack helicopter battalion and the cavalry, replacing all AH-1F and OH-58C aircraft. This will complete the conversion of the Aviation Brigade, 71D(L), to a night fighting unit, capable of deploying within a moment's notice, finding the enemy and destroying him, during day and night, anywhere in the world.

The Aviation Brigade, 71D(L), will gladly assist any light infantry unit preparing for the BCTP for warfighting. We will provide unclassified copies of battle books, slides, and briefings used to prepare this division for the warfighter exercise. We also can provide information concerning the recent fielding of the AIM-1 laser designator system to Fort Ord, CA, and its proven effectiveness on the night battlefield.

Captain Thomas M. Muir
7ID(L), Aviation Brigade, S-3
Fort Ord, CA

Editor:

The aviator paces, waiting for official confirmation of what she already knows to be fact. She is pregnant. She wonders if it is the right time to start a family. Then she thinks, as an aviator, when is it ever the right time? Several events will occur over the next 9 months. She will undergo changes in her body, watch her peers fly, and experience disqualification from aviation service. Presently, these items are unavoidable. However, the disqualification issue needs addressing. Pregnancy should not disqualify aviators from aviation service.

Army Regulation (AR) 600-105, *Aviation Service of Rated Army Officers,* paragraph 3-9, provides for medical disqualification from aviation service. It states, "When a medical condition exists that will require more than 6 months to resolve and that renders an aviator unfit, the United States Army Aeromedical Center (USAAMC), (Fort Rucker, AL), must be notified." The commander, USAAMC, recommends to Headquarters, Department of the Army (HQDA), that they publish orders disqualifying the aviator from aviation service.

This process occurs when women aviators become pregnant. Once they are determined pregnant, initiation of the process begins. The regulation focuses on illnesses or injuries that may not resolve themselves within a specified period. Often, these individuals do not return to regular flight service.

Pregnancy, however, is a predictable medical condition. The pregnant aviator stands a 99.9 percent chance of returning to full flight duty with no complications.

Flight surgeons agree on the grounding issue. They also agree the disqualification is not necessary. In this case, the regulation focuses on the exception, not the norm. The aviator has two options. She may follow the rule and face disqualification, or she may wait 4 to 5 months before telling the flight surgeon of her condition. While the latter is more of an ethical issue, both have negative results.

Those women who choose to disregard the system do so for two reasons. First, they are trying to avoid disqualification. This often backfires because the flight surgeon can back date a date of incapacitation, which results in the aviator's disqualification. There have been exceptions. Some aviators who waited until the second trimester were not disqualified. Their aviation service and flight pay continued throughout the pregnancy.

Second, many women feel no different during the first months of pregnancy. These normal feelings help justify to the aviator her disregard for the system. Flight surgeons maintain the first trimester is critical to fetal development and the woman's physical reactions to pregnancy are unpredictable. Most women, however, do not usually see an obstetrician for the first time until 6 to 8 weeks. Some women do not realize they are pregnant until this time. At this point, they are one-half to two-thirds through the first trimester. Therefore, another month is not such a long time to wait to see the doctor.

Those women who bide by the system lose an additional 6 to 8 weeks of flight time following pregnancy. Once the aviator can return to full flight duty, she still must wait for requalification orders. These orders must be in hand, or verbal authorization received from HQDA, before she can actually fly. This process takes 6 to 8 weeks because the paperwork must go through USAAMC for review before it goes to HQDA for publication of orders. This lost time is important because the unit cannot use a fully capable aviator because of the time lag involved with the paperwork.

Possible solutions to the disqualification issue exist. An exception to policy to the regulation, when disqualification does not occur, is one solution. Another alternative is to allow the aviator to perform limited flight duties until the second trimester. The simple solution is the exception to policy as it only requires a change to the regulation. Thus, the issue becomes administrative rather than medical. A regulation change eliminates the paperwork and lost flight time because there is no disqualification. It gives the approval authority for "fit to duty" to the local commander. The aviator remains grounded until the postpartum checkup, but does not lose the flight time afterward. She can become a flight asset to the unit more quickly.

The second solution contains more complications. The obvious concerns for miscarriage and sudden incapacitation are important factors. These concerns are pertinent in any situation, not just in flying. The same sudden incapacitation could occur while driving a car or riding a bicycle. The advantage of being in the aircraft with flight limitations is that another pilot is in the other seat. Vibrations and other aspects of the aviation environment may have adverse effects on the fetus. These conditions require testing and can impact on the feasibility of this option. Women who have waited to report their pregnancies have had successful pregnancies and produced healthy babies. While this is not adequate proof that babies will have no detrimental effects, it does support the option for limited flight duty during the first trimester.

Disqualifying aviators from aviation service during pregnancy is not necessary. Women have demonstrated the ability to perform flight duties while in the early stages of pregnancy. The simpler solution is to affect an exception to policy to the regulation. During the pregnancy, aviators still perform the aviation-related duties required of their positions. They fill operational flying slots and should still receive credit for this time. Disqualification from aviation service implies a permanent condition. In cases of pregnancy, the aviator returns to full flight duty.

Many questions remain regarding this issue, but with today's reduction in forces, and the availability of qualified aviators, the issue requires addressing.

Captain Cynthia M. Lamb
Aviation Officer Advanced Course, Class 90-3
U.S. Army Aviation Center
Fort Rucker, AL

Response: **The author should reconsider stating the problem and her proposed solutions more concisely and update her knowledge of the problem. August 1990 was a long time ago on this issue.**

The term "disqualification" is misused. Medical disqualification means you do not meet a published standard; i.e., vision worse than 20/20 is disqualifying; pregnancy is disqualifying. The act of publishing orders for a medical disqualification is "medical termination from aviation service."

Captain Lamb disregards the fact that the USAAMC; U.S. Army Aviation Center, Aviation Proponency, Fort Rucker, AL; and waiver authorities have been at work looking for solutions to the pregnant aviator's administrative problems. Many improvements have been made in the last 3 years.

An exception to policy cannot be made because the flight pay

issue is a federal law, directed by Department of Defense Pay Manual, which can only be changed by a change in the federal law.

Proposed solutions must not discriminate against men with medical conditions that are likely to result in return to flying duties in less than 9 months but more than 6 months and face the same administrative problems.

Lieutenant Colonel Kevin T. Mason, MD, MC, SFS
Director, USAAMA
Fort Rucker, AL

Editor:

As I read the January/February 1992 issue of the *U.S. Aviation Digest,* I saw the 1991 subject index and noticed something missing: nuclear, biological, and chemical (NBC) training. I saw nothing about Aviation and NBC during Operation Desert Storm.

I am a chemical operations specialist in a headquarters and service company supporting an attack helicopter battalion. We, as chemical soldiers, know that we must sell NBC. Most of the time, NBC training is swept off of a training schedule to fulfill some other "important training."

When (then) the 3d Armored Division was called to the war in the Gulf, countless aviators and others approached me and were begging for NBC training, and information on the use of NBC equipment. Now that we have long since returned, NBC is once again on the back burner. No one is interested in that priceless advice that I gave them before the war.

In 1991, the M43 protective mask was introduced to AH-64 Apache pilots Armywide. While it is strictly for aviator use, and a new piece of equipment, pilots should be informed of common problems or new ideas in operating it. Where better to inform aviators on equipment maintenance than in the pages of your professional bulletin, which is widely read by pilots in our battalion? Support from you would influence many aviators to take NBC seriously, and maybe save some lives in future battles.

SPC Michael D. Modlin
Chemical Operations Specialist
Headquarters and Service Company
2/227th Attack Helicopter Battalion, APO AE

Editor:

The term "lessons learned" may be new to you, but we learn through experiences everyday. "Experience is the best teacher" and that's what our program is all about. A lesson learned is simply a recorded experience of value in conducting future programs or modifications.

The U.S. Air Force (USAF) Lessons Learned Program is a corporate memory bank of past experiences, positive and negative, available to Department of Defense employees and certified government contractors through on-line access. U.S. Army and Navy lessons also are screened quarterly and appropriate lessons are entered into the databank. The Center for Supportability and Technology Insertion (CSTI), USAF Lessons Learned Program Office, Wright-Patterson Air Force Base (AFB), OH, manages the program. The program imparts experiences from those who have it to those who need it.

The lessons learned staff assist customers by providing packages of lessons for a particular impact area: configuration management, contract management, provisioning, etc. Our databank contains lessons grouped into 67 different impact areas. Impact areas can be added or deleted as necessary. The databank can be searched by impact area, keyword, or program phase. Lessons learned can and should be used in every phase of an acquisition program.

The lessons learned staff is continuously receiving feedback from users and reviews the databank to update or delete lessons when appropriate. User feedback helps us make improvements and ensures lessons in the databank are significant, valid, and applicable. The databank undergoes an annual revalidation to ensure that the lessons are current and up-to-date. We can get more from our limited resources by accentuating positive experiences and eliminating negative ones. Using lessons learned is the key to improved reliability, maintainability, lower costs, supportability, readiness of present and future weapons systems, and improve the way we do business.

We welcome lessons submitters and validators. Guides on how to write and validate lessons, and forms for submitting lessons are available upon request. You can enhance the lessons learned program through your participation. You may have discovered a new process, or innovative technique, or see where design improvements can be made. The objective of the program is to improve the acquisition process by not repeating the same mistakes again. While the bulk of lessons maintained in the databank are acquisition related, we are expanding our databank to include lessons in operational areas: Blue Two, TechTIPS, TechTAPS, Operations Desert Shield and Storm, and others.

For more information on these programs, contact the USAF Lessons Learned Program Office, ATTN: CSTI/PI, Wright-Patterson AFB, OH 45433, or phone DSN 785-7900/1606 or commercial 513-255-7900/1606.

The lessons learned staff (Mr. Bob Kerr and Ms. Nancy Bach) stands ready to assist you in submitting lessons, retrieving lessons

from the databank, providing online access, or providing the lessons learned briefing and training on how to write and validate lessons.

You can take advantage of our services by writing to the USAF Lessons Learned Program Office, ATTN: CSTI/AML, Wright-Patterson AFB, OH 45433-5000, phone DSN 785-3454 or commercial 513-255-3454. You also may leave a message after duty hours by calling DSN 785-5238 or commercial 513-255-5238.

Editor:

The Seventh International Symposium on Aviation Psychology will be held in Columbus, OH, 25 through 29 April 1993. Ohio State University (OSU), Department of Aviation personnel, and the Association of Aviation Psychologists will host this biennial event.

The objective of the symposium is to examine and improve the role, responsibility, and performance of human operators who are in the aviation system. The theme for this symposium has not yet been decided; however, it will reflect an emerging issue of importance in the aviation field.

This general call for papers is issued to anyone who wishes to present a paper or conduct a workshop on Cockpit Technology, Pilot Reliability, Pilot Workload, Pilot Judgement, Crew Resource Management, Air Traffic Control Human Factors, Simulation and Training, Maintenance Human Factors, Accident Investigation, and Physiological Factors. The deadline for submitting brief (300 words) abstracts of proposed papers or workshops is 30 September 1992. Author(s) should include a brief (1 page) biographical sketch. A proceedings of all papers presented will be published.

Submissions should be addressed to Dr. Richard S. Jensen, Department of Aviation, OSU Airport, 2160 West Case Road, Columbus, OH 43235.

Editor:

The U.S. Army Officer Candidate Alumni Association (TUSAOCAA), Incorporated (Inc.) is soliciting voluntary donations. The donations are for a special fund dedicated to the maintenance of Wigle Hall, Officer Candidate School (OCS) Hall of Fame, Fort Benning, GA. Reduced budgets have left the 3d Battalion (Bn) (OCS), 11th Infantry, the present OCS training Bn, with insufficient funds to improve or properly maintain Wigle Hall. The alumni association has agreed to assist the commander in his efforts to improve the appearance of the building.

The OCS Hall of Fame recognizes those graduates of the OCS at Fort Benning and the Ground General School, Fort Riley, KS, who have distinguished themselves by attaining the rank of colonel, earning the Medal of Honor, or achieving success in state or federal service.

If you desire to participate in this voluntary effort, make check payable to TUSAOCAA, Inc., Wigle Hall Fund. Send donations to Secretary (ATTN: Mr. Chester F. Alderfer), TUSAOCAA, Inc., Post Office Box 2192, Fort Benning, GA 31905-2192.

The association also is seeking new members. Regular membership is open to graduates of any Army OCS. Associate membership is open to graduates of other services' OCS and other persons who support the OCS program. For more information about membership and dues write to the address above, or call commercial 404-322-4622.

Oops! In the May/June 1992 issue, the article "Comanche, Restructuring to Meet the Requirement," figure 3, Force modernization, page 40, erroneously shows **25** Comanches fielded into the Attack Battalion (Heavy Division/Corps). The correct number should be **10** Comanches.

Editor:

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FM 100-5, *Operations*

A Paradigm For Adaptation

Lieutenant Colonel Michael R. Rampy
School of Advanced Military Studies
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FM 100-5 is the centerpiece of the doctrinal assessment and development process.

The key is doctrine and the keystone is FM 100-5, *Operations*. The Army relies on its doctrine to provide intellectual focus and precision for everything it does.

For more than 45 years, our nation and our Army focused on the defense of Western Europe and the containment of communism. The Soviet Union—the major concern of our defense efforts for over 4 decades—no longer comprises a significant threat. A national military strategy of containment, strengthened with forward-deployed forces and a credible nuclear deterrent, proved its relevance. We succeeded.

As flexible response and forward deployment in Western Europe fade, we must confront the complexities of a new strategic environment, one that is multipolar, interdependent, and regionally oriented.

Adapting to a world that has changed more broadly and more fundamentally in the last 2 years than at any other time since the end of World War (WW) II imparts a unique set of challenges for our Army. Now—more than ever before—we serve as a strategic Army, a land force America and its allies count on to meet our global responsibilities in peace, crisis, and war.

The Strategic Environment

In his ***National Security of the United States*** strategy document (August 1991), President George Bush posed the four fundamental demands of the new strategic era: ". . . to ensure strategic deterrence, to exercise forward presence in key areas, to respond effectively to crises, and to retain the national capacity to reconstitute forces should this ever be needed."[1] This new national military strategy, the most prominent shift since the mid-1950s, focuses on regional threats whose capabilities and intents are not readily discernible.

The threat covers the spectrum from illicit drugs and terrorism to the proliferation of technology and weapons of mass destruction. Simultaneously, a strategy of power projection means we will respond to crises primarily with forces based in the continental United States.

At home, resources previously committed to defense are now going to other national priorities. Part of the change in strategy is a diminishing resource base. Moreover, these fundamental changes to our strategic environment predicate we divest ourselves of nonessential assets and activities.

This entails identifying and maintaining our core capabilities—then eliminating the rest. Our guide to how we do this, and how we apply the resources that remain, is doctrine.

Role of Doctrine

Fortunately, we find ourselves in an era of doctrinal renaissance. The Army today is more aware of the critical ***role of doctrine*** than at any other time in our nation's history. Furthermore, there are few times when the military has had such a unique opportunity to shape its own future.

In this regard, we approach the new era from a position of strength, a strength based on a highly professional force. Trained, proven, confident, and dedicated, our officers, noncommissioned officers, and soldiers stand ready to focus their energies on the challenges ahead. The lens that will allow them that focus is doctrine.

America's Army has always been a reflection of our society. Doctrine must complement the national military strategy and reflect the uniqueness of our Army and the American way of war. We have always been, as we are today, a unique combination of active duty professionals, volunteer militia, and citizen-soldiers serving as volunteers or conscripts.

Purpose of Doctrine

Doctrine is not a peripheral concern; it is the heart of our Army. Doctrine is the essential first step in developing a plan of action designed to accomplish near-term objectives and to confront future exigencies.

D.W. Knox, in his excellent treatise on the nature and role of doctrine, asserts "[a] sound, comprehensive, all-pervading doctrine . . . is as important to an army as its organization."[2] [Doctrine] is the vital link

between organizational thought patterns and reality, a common frame of reference for our Army. It lies in the continuum between theory and application; it must comprehend both, yet favor neither.

The Joint Staff defines military doctrine as a set of "fundamental principles by which military forces guide their actions in support of national objectives. Doctrine is authoritative, but requires judgment in application."[3]

Effective doctrine is like a mirror: hold it up and it reflects our image, our nature, our purpose. Sometimes we agree with what we see; other times we do not.

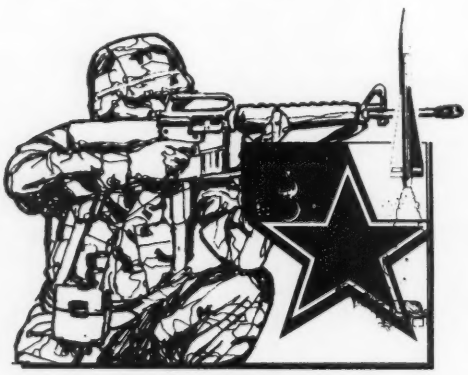
The salient point is the mirror—doctrine—should always reflect the image of our Army. If the image lacks clarity or is not consistent with our perceptions, it requires revision.

While doctrine articulates how we do our business, it is only a guide to action, not a prescriptive checklist on "how to fight." Professor I.B. Holley contends "military doctrine is an officially approved teaching, precept, guide to action, a suggested method for solving problems or attaining desired results . . . doctrines are not hard-and-fast rules to be slavishly applied; they are suggestive."[4]

Doctrine is the means by which we convey concepts, information, and terminology to our Army. One of doctrine's principal purposes is to facilitate discussion and communication—both inside and outside—of the profession of arms. Its evolution clearly indicates the ". . . great value of doctrine is less the final answers it provides than the impetus it creates toward developing innovative and creative solutions . . . ."[5]

The Army relies on its doctrine to provide intellectual focus and precision for everything it does. One of its principal purposes is to allow us to think as a corporate body and, thereby, have consistent expectations in the conduct of our business.

This intellectual process strengthens our organization; identifies the essence of the army, stimulates dialogue among professionals, engenders writing, both professional and personal, and codifies our thoughts. Consequently, doctrine is the mechanism that bonds the Army to its sister services and its alliance and coalition partners.



We serve as a strategic Army, a land force America and its allies count on to meet our global responsibilities in peace, crisis, and war.

Factors of Doctrine

External and internal factors combine to shape the development of doctrine and have far reaching implications on its ability to adapt. We can exert a measure of control over some factors; others we cannot. The issue of controlling these significant factors is less important than understanding what they are and how they affect doctrinal development.

External. Throughout the evolution of our doctrine, the most significant external influences have been the threat, national security policy, technology, budgetary constraints, public support, and national values. These factors in varying proportions have had, and will continue to have, a significant impact on how our doctrine develops.

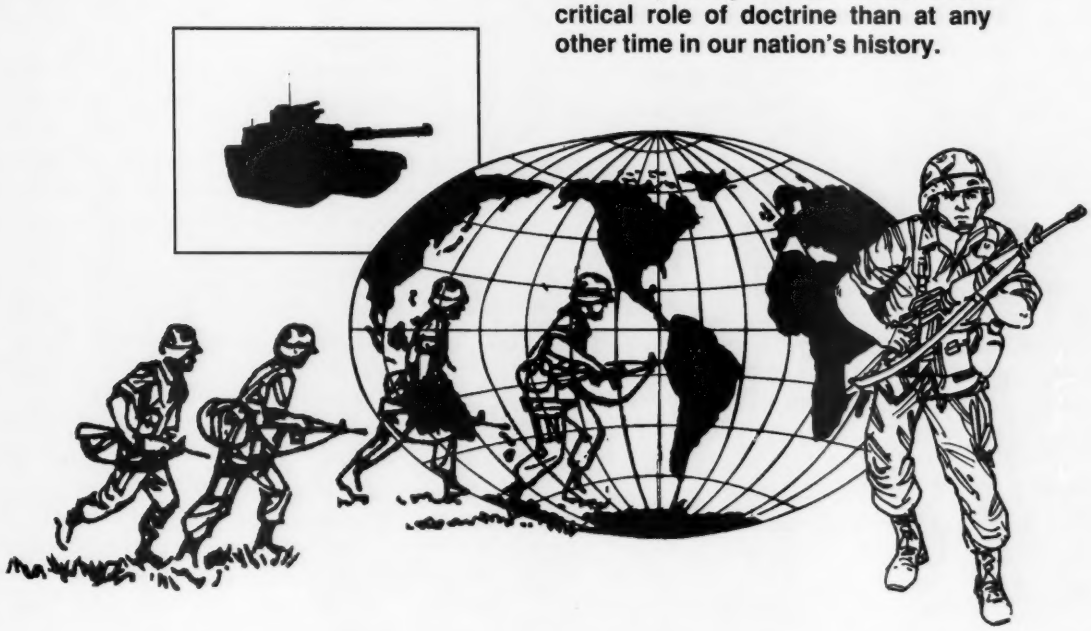
National security policy is fundamental to the revision of doctrine. Colonel Bob Doughty, the author of the insightful book ***The Seeds of Disaster***, details the failed French doctrine of WWII. He contends that, for us, "no single factor [drives] the development of Army doctrine, but changes in national security policy lay at the basis" of any sweeping changes. When national security policy and national military strategy shift, "profound changes [occur] in the Army's doctrine, organization, and equipment."[6]

With the recent significant change in our strategy, we can expect, if history is any indication, "profound changes" will soon occur. We must plan for and manage those changes with great foresight.

The relationship between technology and doctrine is complex. This is due, in part, to the differences between the dynamic nature of technological advances and the seemingly laborious pace of doctrinal development.

Before World War II, Ferdinand Miksche, an early proponent of maneuver warfare and an advocate of the integration of technology and doctrine, asserted technology has a dramatic influence on the nature of war.

The Army today is more aware of the critical role of doctrine than at any other time in our nation's history.



War undergoes continual evolution. New arms give ever new forms to combat. To foresee this technical evolution before it occurs, to judge well the influence of these new arms on battle, to employ them before others is an essential condition for success.[7]

Public support and national values determine national security that, in turn, determines the nature and scope of doctrine. Therefore, doctrine must reflect this synthesis of national security policy, potential, and capabilities, public support, and a firm foundation in our national values.

Internal. Internal factors, many that we can influence directly, include institutional tensions and experience. The internal tension created by service parochialism and the seemingly endless fight over roles and missions have a direct impact on doctrinal development.

As a result, doctrine is frequently a contentious issue, because the services often cannot agree on the best way to prepare for the next war. Creating a strategy to contend with a new global environment must be the result of a logical thought process based on the needs of the nation.

Experience affects doctrine. History is replete with examples of armies that learn only in defeat; good armies also learn in victory. Ours is a good Army. We must learn in victory and thereby never suffer a defeat.

Questions About Doctrine

While the best measure of a doctrine is its application, we must be able to assess its probable effectiveness short of conflict; to wait until conflict occurs may be too late.

We should continuously ask four questions of our doctrine: Is it ***relevant*** (does it address the threat)? Is it ***achievable*** (will it work given current resources, both physical and political)? Is it ***acceptable*** (will the Army and the American public accept it)? Is it ***adaptable*** (can it adapt to changes in a dynamic strategic environment)?

The more affirmatively we can answer these questions, the more likely we have the correct doctrine. The following statements help us maintain correct doctrine.

Relevance is a perceived relationship between adversaries; a doctrine based on the wrong perception of the threat is not relevant and in danger of failure.

Achievability comprehends the availability and application of resources. Doctrine must take a concept and translate it into a more assured appreciation of the constraints, both physical and political, of the present.

Acceptability is essential to the American way of war in terms of the least expenditure of friendly casualties and national wealth, and strong adherence to our national values. Not only must the Army accept and implement the doctrine, but also the public must accept doctrine as the accurate translation of national values and democratic ideals into military application. To violate this rule is to risk rejection.

Adaptability is a pivotal factor in assessing doctrine. In the void between organizational preference and operational requirements lurks the potential for disaster.

A Historical Perspective of Doctrine

Any review of the Army's operational doctrine must begin with its keystone manual, Field Manual (FM) 100-5, ***Operations***; from it, all other Army doctrine derives. FM 100-5 traces its roots back to the beginning of the Army.

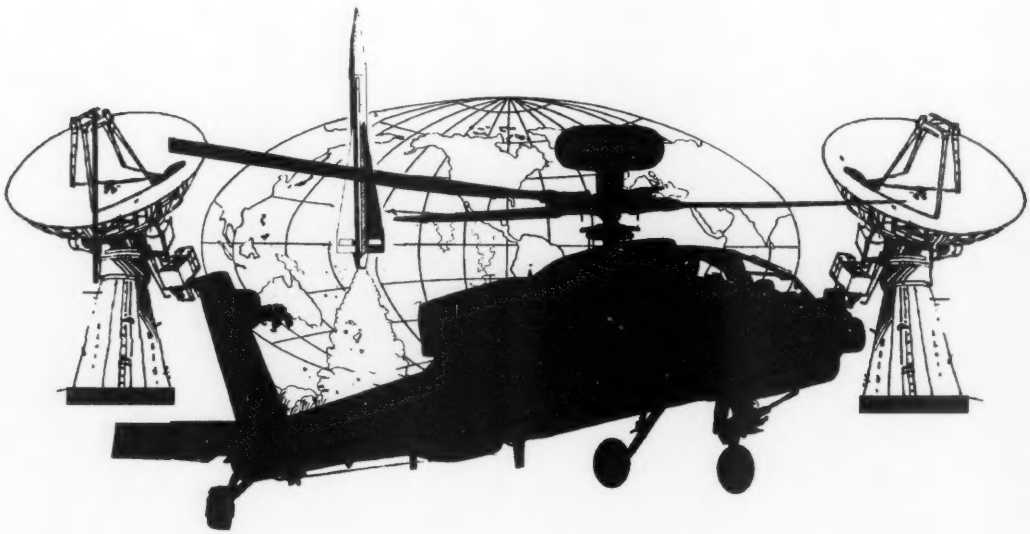
From the Revolutionary War through the wars of the 19th Century, our doctrine appeared in different guises, much of it imported from Europe. From the manual's inception in the early 20th Century, when it first took on its modern name (although then still labeled a field service regulation), through the turbulence of two World Wars, Korea, Vietnam, Grenada, Panama, and Saudi Arabia, FM 100-5 has served us to varying degrees.

A high point was the 1941 version of the manual. In that year, ours was a nation on the eve of conflict: we faced the specter of war on a scale we could not have imagined only a few years before.

The historical challenge was clear: develop the appropriate doctrine for the appropriate time, or suffer the consequences. We focused our energies and got it right, although not without updating the manual at better than a once-a-year rate throughout the war.

The years following WWII witnessed a decline in doctrine. We entered Korea unprepared for the type of war we fought; our doctrine was neither relevant nor adaptable. A decade later, we entered our longest war, Southeast Asia, never incorporating its realities into our keystone doctrine. Doctrine seemed to have lost its relevance and adaptability.

The renaissance of doctrinal awareness in modern times began in 1972 with Operation Steadfast, the dissolution of the Continental Army Command into two distinct, specified commands: U.S. Army Forces Command, Fort McPherson, GA, and U.S. Army Training and Doctrine Command (TRADOC), Fort Monroe, VA. TRADOC's primary mission was to



. . . we must confront the complexities of a new strategic environment, one that is multipolar, interdependent, and regionally oriented.

focus on updating the Army's training and doctrine programs.

This resulted in the 1976 version of FM 100-5, the Active Defense and the "How to Fight" series of manuals. The 1976 version of FM 100-5 engendered acrimonious debate, yet served one important purpose--it reminded our Army of the purpose and importance of doctrine.

The 1982 and 1986 versions of FM 100-5 brought us out of the attrition-based active defense and into the maneuver warfare of AirLand Battle. We embraced the offensive spirit again and recognized the joint nature of operations.

The Keystone of Doctrine: FM 100-5

FM 100-5 is the instrument for managing and implementing adaptation and change. The criticality of changing doctrine is evident. It is noteworthy that in ". . . few spheres of human activity are change and progress so constant and the need for accommodation and adjustment so unremitting as in the military."[8]

FM 100-5, our keystone doctrine, should be an all-encompassing expression of how the strategic, total Army intends to fulfill its obligations across the continuum of military operations. The manual must expand both: vertically, to address in more detail the strategic-operational linkage; and, horizontally, to encompass operations across the continuum of military operations in peace, crisis, and war.

We need a doctrine-based approach to managing change in our Army as we make a disciplined transition into the future. I emphasize ours is an intellectual and a pragmatic doctrine, a means to focus our efforts in these turbulent times. The caution, as Colonel [Professor] Bob Doughty has so aptly pointed out, is ". . . intellectual changes can sometimes be more difficult to achieve than material changes." [9]

Doctrine, of course, is not an end in itself, but the means to an end in the larger context of national security policy. It must comprehend the lessons of the past, grasp the realities of the present, and function as a paradigm for adaptation in the future.

FM 100-5 is the centerpiece of the doctrinal assessment and development process. This manual must be an all-encompassing expression of how the Army intends to fulfill its strategic and operational commitments around the world. Clearly, we must capture the traditional and nontraditional aspects of our global operations. As we expand the scope of FM 100-5, however, we must not dilute the Army's fundamental purpose: to fight and win our nation's battles.

Our doctrine must avoid any uncertainty between the Army and the American people, if it is to pass the critical test of acceptability. To have meaning in the contemporary strategic environment, our doctrine cannot afford to focus solely on the business of warfighting; it must account for our other missions as well.

The result of any revision must reflect the uniqueness of the American view of war. To be useful, this manual must comprehend and support the fabric of national policy and strategy. It must be specific enough to provide a guide for operations, yet flexible enough to adapt to a constantly changing strategic environment.

We are maintaining the edge while bringing our size down, reshaping and adapting at the same time; in so doing we must keep the current situation in perspective. Ours is an Army in the finest condition we have ever seen. Having faced such challenges before, we will avoid the historical pitfalls of a victorious Army in reduction.

The key is doctrine; the keystone is FM 100-5, ***Operations***, our paradigm for adaptation. ❐

ENDNOTES

1. White House, ***National Security Strategy of the United States*** (Washington, D.C.: USGPO, August 1991), p. 25.

2. Russell F. Weigley, ***The American Way of War: A History of United States Military Strategy and Policy*** (Bloomington: Indiana University Press, 1977), p. 511.

3. DOD Pub 1: ***Dictionary of Military and Associated Terms*** (Washington, D.C.: JCS, June 1987), p. 118.

4. Robert L. Pfaltzgraff, ***Emerging Doctrines and Technologies: Implications for Global and Regional Political-Military Balances*** (Lexington: Lexington Books, 1988), p. 14.

5. MAJ Robert A. Doughty, Leavenworth Paper Number 1: The Evolution of U.S. Army Tactical Doctrine, 1946-1976 (Leavenworth: USACGSC, Combat Studies Institute, August 1979), p. 2.

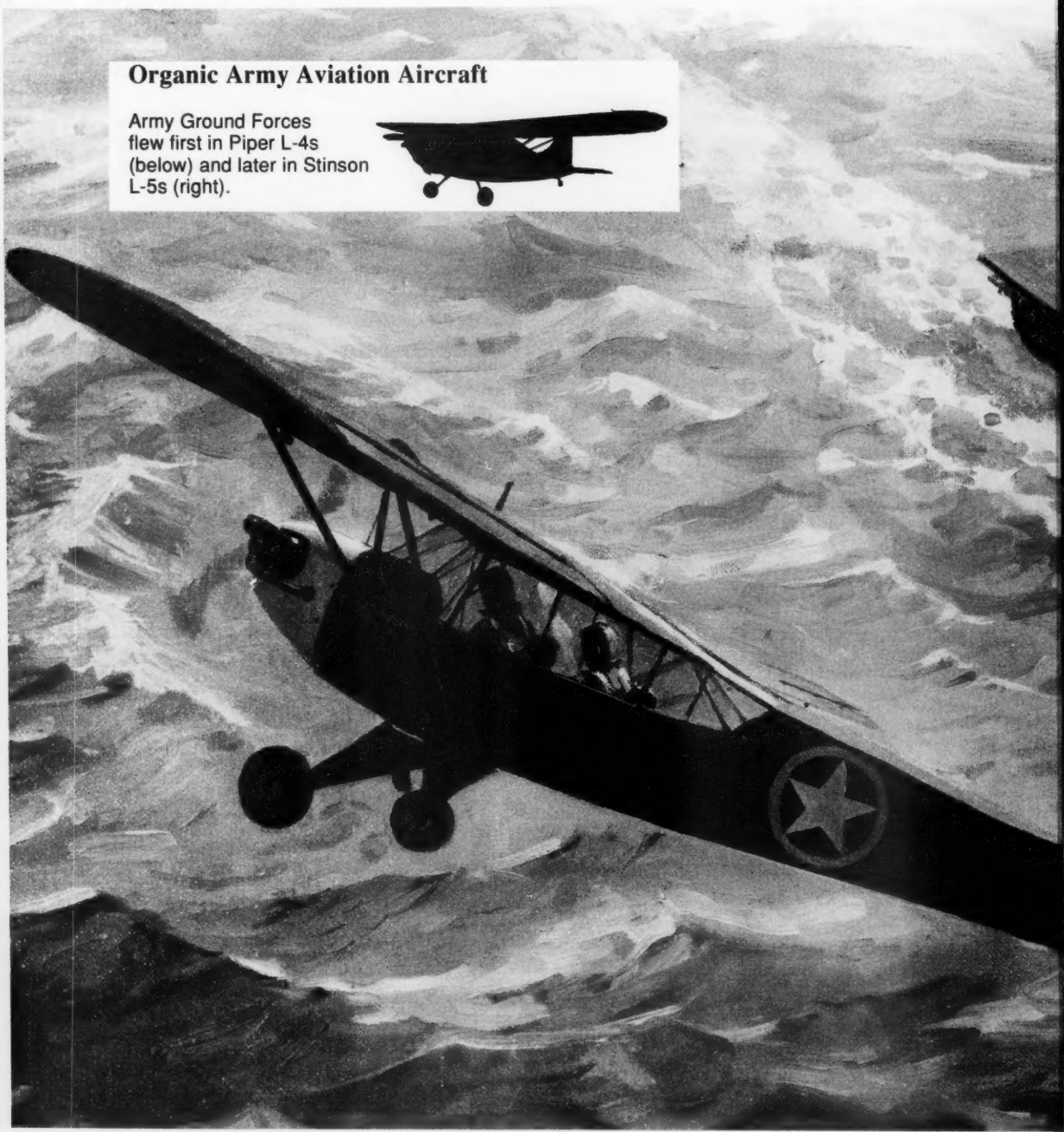
6. Ibid., p. 47.

7. Pfaltzgraff, op. cit., p. 7.

8. John P. Campbell, "Marines, Aviators, and the Battleship Mentality, 1923-33," ***The Royal United Service Journal***, February 1964, p. 49.

9. Ibid., p. 47.

Organic Army Aviation in World



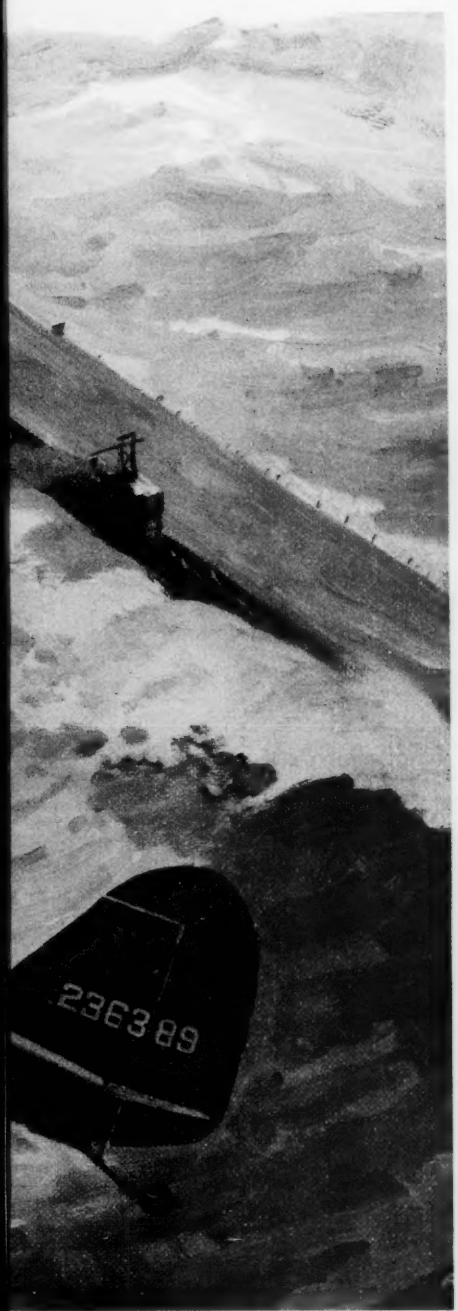
Organic Army Aviation Aircraft

Army Ground Forces flew first in Piper L-4s (below) and later in Stinson L-5s (right).

War II

Part 2
1944-1946

Dr. John W. Kitchens
Aviation Branch Command Historian
U.S. Army Aviation Center
Fort Rucker, AL



The Field Artillery Branch of the Army Ground Forces (AGF) tested aerial observation and fire adjustment from lightweight organic aircraft from 1940 to 1942. The tests led to the establishment of organic Army Aviation on 6 June 1942. Part 1 in the last issue related the details.

Rivalry between the AGF and the Army Air Forces (AAF), later the U.S. Air Force, over the role and mission of organic Army Aviation began with the initial testing of the concept and continued for over 30 years. The AAF viewed organic aviation with wariness, when not with outright hostility.

The air forces failed to furnish the ground forces with the type and quality of aerial support being provided by organic aviation. In spite of this, leaders blocked the expansion of the tiny new air arm of the AGF and, on occasion, attempted to absorb or abolish it. Conversely, the AGF sought to expand the size, mission, and authority of organic Army Aviation. Disputes between the two Army commands were allayed temporarily through compromise or War Department edict, only to resurface later.[1]

The principal aircraft used by organic aviation during World War II (WWII) was the Piper L-4. It was an excellent plane for daytime artillery fire adjustment, as well as for several other types of missions. From the time the L-4 first entered combat in North Africa in 1942, however, several shortcomings became apparent: limited range and speed, inability to operate at high altitudes, and problems involved in nighttime flying.

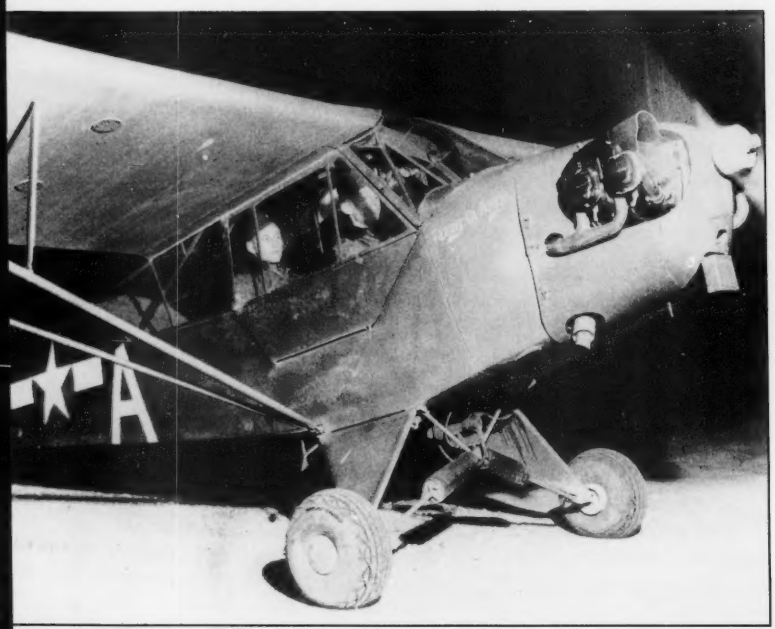
The liaison plane most widely used by the AAF was the L-5, manufactured by the Stinson Aircraft Division of Consolidated Vultee Aircraft Corporation. Compared to the L-4, the 185-horsepower L-5 was faster, could operate at higher altitudes and carry more weight, had a longer range, and was easier to operate at night.

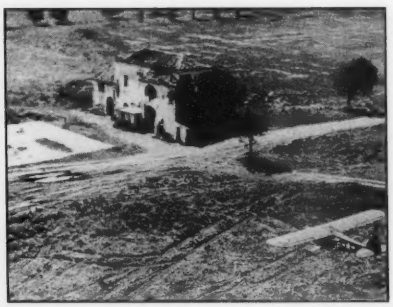
As early as the North African campaign, some ground units began to request the larger Stinson aircraft for use in mountainous areas. Although the ground forces managed to acquire a few L-5s for testing in 1942 and 1943, no others were authorized for the AGF until 1944.

One reason why the AGF did not request more L-5s was ground forces leaders believed the acquisition of higher performance aircraft would intensify the AAF opposition to organic Army Aviation.[2]

The L-5 aircraft generally were not needed for artillery fire adjustment. Moreover, the War Department, as well as the AGF, tended to be cautious with regard to any suggestion of officially expanding the mission of organic Army Aviation. For, example, it was widely known portable cameras were used in L-4s for aerial photography. In February 1944, however, the War Department disapproved a proposal to upgrade this aircraft by mounting cameras because of AAF opposition.[3]

In mid-1943, the AGF in Italy acquired a few L-5s intended for





Army Ground Forces in Italy

TOP: Oxen teams and aircraft share a runway in Orbetello, Italy.

LEFT: M.J. Strok (right) and R.W. Blake leave on a night flight.

ABOVE: An L-4 pilot on patrol looks over a house in Italy.

the AAF but mistakenly sent to a Field Artillery unit. According to several sources, the ground forces first used L-5s in combat following the allied breakthrough at Anzio in early 1944.[4]

It seems, however, the AGF may have sent a couple of the L-5s acquired for testing to North Africa in 1943.[5]

Air Forces-Ground Forces Rivalry in 1944

In January 1944, the AAF made another concentrated effort to abolish organic Army Aviation. Air forces leaders were alarmed by the attempts of some ground commanders to obtain higher performance aircraft. They were also concerned about the rapidly expanding use of the L-4s for various missions that had been assigned to the AAF. This concern precipitated the air forces' attempted takeover of January 1944.

In a memorandum for the chief of staff of the Army, General (GEN) Henry H. Arnold, the commanding general of the AAF, charged that organic aviation was overextended, wasteful of resources, and unsound in principle. Furthermore, he claimed, it was being used primarily for unauthorized and unintended purposes.

He then repeated (but more vigorously than on prior occasions) the air forces' recommendation to discontinue organic Army Aviation and resume all liaison and artillery fire adjustment functions by the recently organized AAF liaison squadrons.[6]

GEN Arnold was correct in charging that the *de facto* role and mission of organic Army Aviation had expanded considerably beyond what had originally been authorized. He ignored the fact, however, that the expansion had resulted from the exigencies of combat and from the failure of the AAF to provide the AGF with adequate liaison-type aerial support.

Also, some of Arnold's allegations (for example, his charge that only 5 percent of organic aviation's missions were "for the purpose of adjustment of artillery fire") were gross exaggerations. When organic aviation was authorized in 1942, it was intended not to replace but "to supplement the AAF's responsibility for aerial adjustment of artillery fire" from high-performance aircraft.[7]

Since few of the AAF squadrons that were to have provided this support were actually organized, however, organic aircraft of the AGF provided almost all fire adjustment as well as many other liaison functions during WWII.

In May of 1943, the AAF obtained authorization to organize liaison flights or squadrons, in lieu of the discredited air forces observation squadrons, to support the ground forces. These flights were only beginning to be organized in early 1944.[8] GEN Arnold wanted to hasten the process by having the AAF flights absorb organic Army Aviation and take over its assets and functions. Apparently none of the new AAF liaison flights arrived in the European Theater until mid-1944. Between then and January 1945, the AAF assigned a total of eight liaison squadrons of 32 planes each to the AGF operating in Europe.[9]

In response to GEN Arnold's memorandum of January 1944, Lieutenant General (LTG) Lesley J. McNair, the commander of the AGF, took issue with some of Arnold's exaggerated charges about the use and cost of organic Army Aviation. The thrust of his rejoinder, however, was to observe the main issue was satisfactory air observation for Field Artillery. He asserted artillery air observation by the AAF had never been satisfactory, but that organic aviation was performing this mission in an outstanding manner.

As to wasting resources, LTG McNair observed the cost of organic aviation was "microscopically small as compared with the cost of the air forces as a whole," and was hardly even a factor in the discussion. He, therefore, strongly objected to GEN Arnold's proposed change—especially at that critical time of the war.[10]

The War Department accepted LTG McNair's recommendation that no change be made in organic aviation. To avert a renewal of the controversy, however, the War Department spokesman warned that, should the mission of the ground forces aviation arm be expanded in the future, GEN Arnold could renew his demand that organic aviation be transferred to the AAF.[11]

The War Department also expressed the hope the new AAF liaison squadrons would provide the requisite courier and other liaison service so organic Army Aviation would no longer be diverted from its primary mission.[12]

While GEN Arnold doubtlessly would have desired the total abolition of organic Army Aviation, his demand for such an action may well have been intended, as a practical matter, to prevent its further growth. At any rate, his demand and the War Department's threat to reconsider it appears to have contributed to increased caution on the part of the ground forces leaders. For a few months, they were somewhat quieter with regard to acquiring higher performance aircraft, making modifications on the L-4, and obtaining official recognition

of the *de facto* expanded role of organic aviation.

Few, if any, of the AAF liaison squadrons being organized to support the AGF reached Europe before the beginning of the Normandy invasion; therefore, it was necessary for the ground forces to acquire a few high performance liaison planes to carry out their operations.

By mid-1944, several army, corps, and division headquarters preparing for Operation Overlord had obtained one L-5 each for "special missions." The overwhelming majority of the L-5s used by the AGF during WWII, however, were not received until late 1944 and early 1945[13]

Organic Army Aviation began its third year with the 6 June 1944 major assault against the German forces in France.

Combat: The European and Pacific Theaters of Operations

During the Normandy invasion, some L-4s were dismantled and shipped across the English Channel to Normandy on LSTs (landing ship, tanks); others were flown across with auxiliary fuel tanks in the rear seats.[14]

Major (MAJ) J. Elmore Swenson flew his L-4 across the channel on D Day and conducted one of the first fire missions on Omaha Beach.[15] He subsequently pioneered in attaching rifles to the lift struts of the L-4. Other innovative Army pilots successfully launched rockets from their planes.[16]

As the Allied Armies moved across France and Germany, organic Army Aviation continued to perform the various missions conducted in North Africa and Italy as well as several new ones. In northern Europe, L-4s also were used to direct tank columns and supply trains, to deliver blood plasma and medical supplies, and to rescue downed fighter and bomber pilots.

On Christmas Eve of 1944, during the Battle of the Bulge, Lieutenant (LT) Kenneth B. Schley, a 28th Infantry Division observation pilot, flew a supply of penicillin to the besieged garrison at Bastogne. On some occasions, observation planes were equipped with skis so as to be able to land and take off in deep snow.[17]

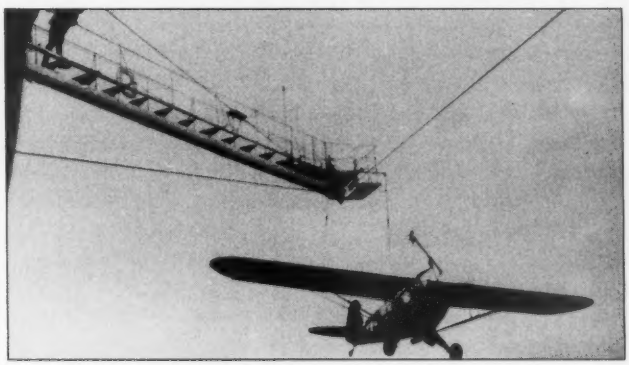
The "Horsefly" technique was much more widely used in the European Theater than in Italy. The L-4 did not have adequate range and speed for this mission, but after mid-1944, the AGF had enough L-5s to perform it on a regular basis. These aircraft, with AGF observers, were used in Horsefly missions principally by units of the XII and XIX Tactical Air Commands in cooperation respectively with the Seventh and Third Armies.

This cooperative effort was studied by a mixed AAF-AGF board in late 1945. Representatives of the two commands came up with opposing recommendations for future close air support (CAS), as was the case with so many other issues involving organic aviation.

Ground forces analysts favored the expanded use of light aircraft with ground forces observers, while air forces analysts favored the use of AAF aircraft to lead fighter-bombers on Horsefly missions.[18]

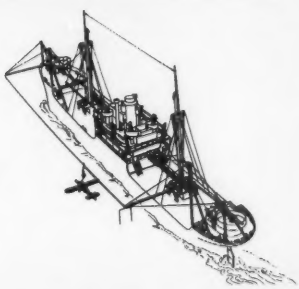
The AGF concern for ensuring proper and adequate CAS by being involved in it would continue to influence relations between the Army and the Air Force for years.

In the island-by-island war against the Japanese in the Pacific, organic Army Aviation performed essentially the same missions as in other theaters. Adjustment of naval bombardment and bombing the enemy with hand grenades were apparently more common in the



The Brodie Device

L-4s successfully landed and took off by means of 300 feet of cabel stretched from booms on LSTs and cargo ships (illustration at right).



Pacific than elsewhere. In the Pacific, as in North Africa and Europe, Army observation pilots captured enemy prisoners on a few occasions.[19]

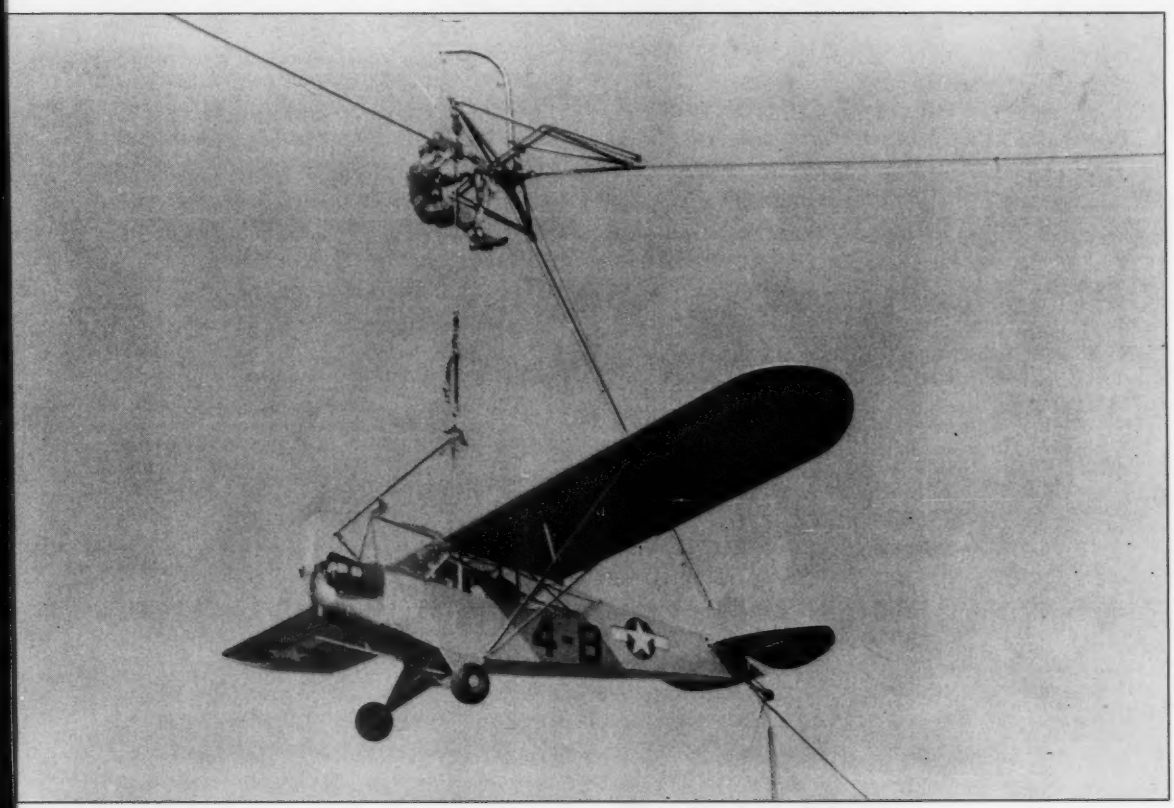
In the Pacific campaigns, L-4s had to be disassembled and transported by sea; they then took off from the decks of LSTs and other type ships and flew to the islands being invaded to adjust fire and perform other missions. When carriers were not involved in an invasion force, the L-4s usually had to land on the beaches. In some instances, wooden floats were attached to L-4s so they could land and take off from water.[20]

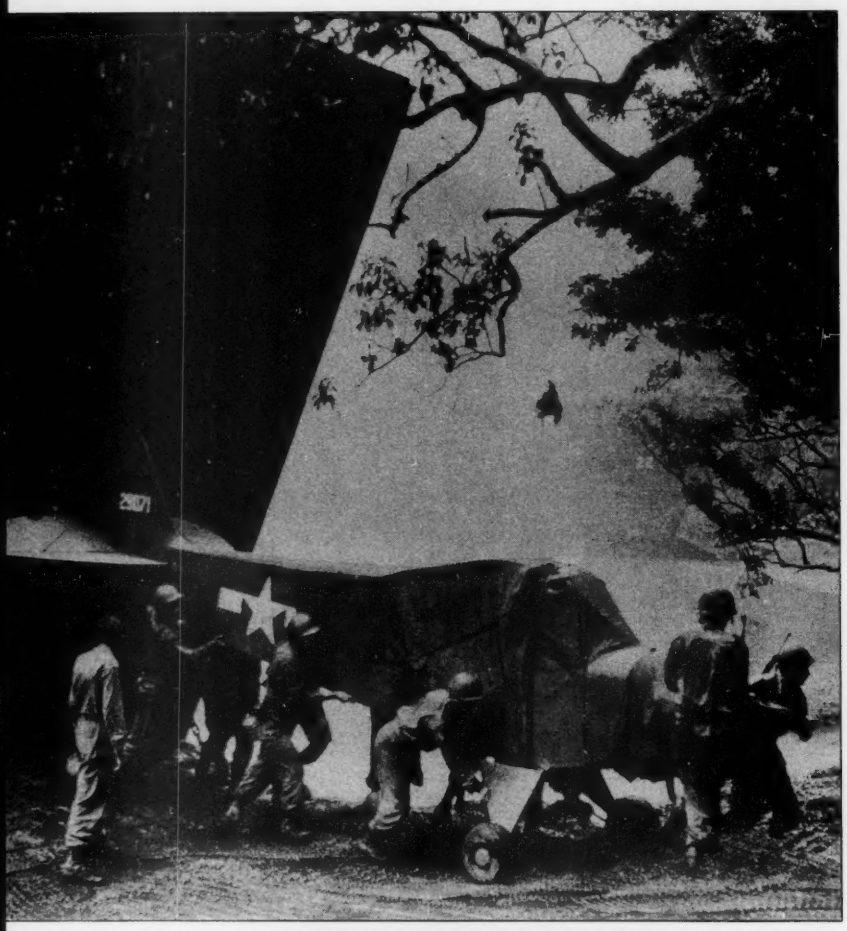
It became possible for the L-4s to return to an LST after the development and deployment of a rig called the "Brodie Device"—named for its inventor, LT James H. Brodie. LT Brodie obtained a $10,000 appropriation in 1943 to develop a portable rig for landing and launching small planes in a tightly confined space.

He built a device consisting of cables stretched between masts, which could bring a small plane equipped with a specially designed hook to a slow stop. The plane could then take off from the cable, or it could be lowered to the ground or a deck for refueling or other purposes and then raised again for take off. LTG McNair witnessed a demonstration of the device in February 1944 and ordered it be tested for Field Artillery observation planes. One of the rigs was installed on an LST and was used effectively by the 77th Infantry Division during the invasion of Okinawa.[21]

The missions performed by organic Army Aviation in the U.S. Third Army during the latter part of the war in Europe represent those conducted throughout WWII. A total of 22,972 hours were flown for fire adjustment; 26,260 hours for reconnaissance; and 19,034 hours for administrative and patrol purposes between 1 August 1944 and 8 May 1945.

The artillery observation planes in the Third Army were used for specific purposes: courier services; transportation of personnel; liaison between units; aerial terrain studies; photography; tracking services for friendly antiaircraft artillery; and control of moving motor units. Other specific purposes were





for locating friendly units, intelligence information, Horsefly activities, command and staff reconnaissance, column control, radio relay, wire laying, emergency resupply, evacuation, and camouflage checks.[22]

The AGF observation planes were used for many purposes other than artillery fire adjustment throughout WWII. Although this was true, ground commanders were generally unable to acquire aircraft properly equipped for the missions until near the end of the war. The two reasons for this problem were as follows: the AAF controlled the procurement and issue of aircraft and aviation equipment; and air forces leaders strongly opposed providing the AGF with planes equipped to compete successfully with the AAF in the performance of liaison missions.

Ground forces leaders, on the other hand, were reluctant to press for higher performance planes or for recognition of many of the missions being performed by organic aviation. They feared raising such

Pacific Theater

TOP: Unloading an L-4 from an LST in New Guinea.

ABOVE: An L-5 from the 5th Liaison Squadron flying over Burma.

LEFT: L-4s at Sandburg Field in the New Hebrides.

issues would lead to the disestablishment of organic Army Aviation.

AGF Organic Aviation

The War Department G3 responded to the overwhelming evidence from the field that larger and better equipped aircraft were required by the AGF. In May 1944, the Department ordered the AGF to initiate procedures to procure a plane better suited to its purposes than the L-4. This was a period of the search for and testing of various planes to replace the L-4. During this period, the long-standing AAF position that AGF planes be used only for artillery fire adjustment suddenly changed.

In a declaration of long-term policy, dated 10 October 1944, the deputy commander of the AAF subscribed to the principle of organic aviation. Not only did he do this, but he also observed that the new plane being selected by the AGF would possess capabilities far beyond those required for artillery fire adjustment. Furthermore, he observed, the AGF should "be encouraged to make maximum use" of those capabilities.[23]

The AGF selected the Piper Corporation's L-14 as its new standard Field Artillery liaison plane. This versatile aircraft was not produced in significant numbers before the war ended. The ground forces acquired only five before the contract was terminated. Consequently, L-5s as well as L-4s were used as ground forces replacement aircraft from late 1944 until the end of the war.[24]

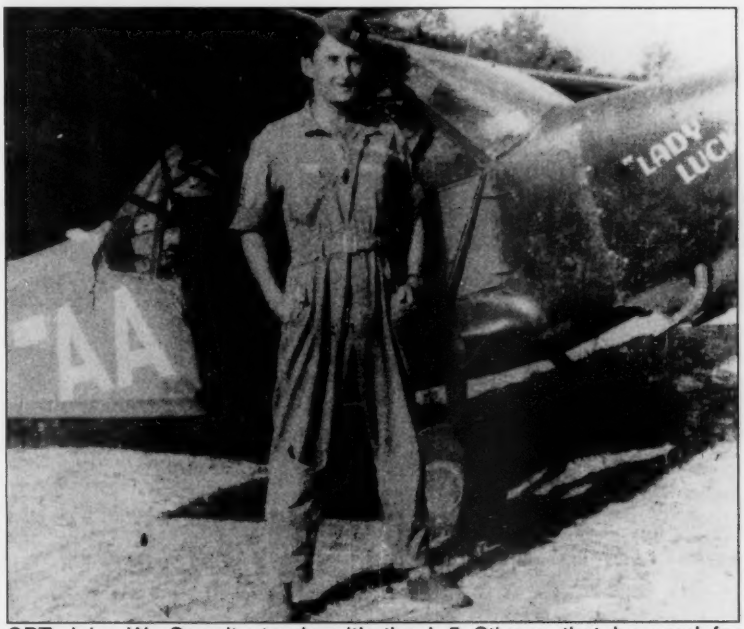
Reversal of the AAF policy on multiple missions and the acquisition of higher performance aircraft for organic aviation encouraged the AGF to attempt to expand the theoretical role of organic aviation. This policy change would make the theoretical role more closely correspond to the *de facto* role.

The first efforts were modest and solidly based on requests from theater commanders. On 5 January 1945, the AGF requested the assignment of L-5 liaison planes to cavalry reconnaissance squadrons. This would mean two additional planes would be assigned to armored divisions so as to improve their reconnaissance capabilities.

The War Department G-3 promptly rejected this request, however, because of the shortage of L-5s and the need to conduct further study of the performance of AAF high-performance tactical reconnaissance aircraft in ground reconnaissance missions.[25]

To comply with the War Department's recommendation for further study of the air forces' use of its tactical reconnaissance aircraft, the AAF sent two ob-

COL William W. Ford established the Flight Training School and developed its courses at Fort Sill, OK, from 1942 to 1944. The success of these graduating "Liaison Pilots" in World War II, a direct outcome of COL Ford's vision, paved the way for later development of Army Aviation as we know it today. COL Ford was inducted in the Army Aviation Hall of Fame in 1975.



CPT John W. Oswalt stands with the L-5 Stinson that he used for "Horsefly" missions, later called forward air control missions. CPT Oswalt, who later became a colonel, flew these missions north of Rome, Italy, in 1944. He was inducted into the Army Aviation Hall of Fame in 1976 for the period 1942-1949. COL Oswalt, one of the first L-Pilots sent to a WWII combat zone, landed in Morocco with General Patton's Western Task Force in 1942 (notice his cap tilted "tanker-style").

An L-4 is temporarily grounded by a flood in Rambervillers, France, in 1944.

servers to Europe and other theaters in early 1945. These two observers were Colonel (COL) John C. Bennet, a former WWI pursuit pilot, and Lieutenant Colonel Robert R. Williams, who served in both AGF and the AAF during WWII.

They recognized and reported that the enlisted AAF liaison pilots lacked sufficient knowledge about the requirements of the AGF to perform their assigned missions adequately.[26] Their reports were forwarded to AGF headquarters in April. These reports coincided with the ground forces' point of view in every respect. The AGF used them to justify their new request for the expansion of organic aviation.

Accordingly in May 1945, the acting commanding general of the ground forces proposed that five light planes be provided to each infantry, airborne, armored, cavalry, and mountain division; he also proposed two planes be provided to each cavalry reconnaissance squadron. The request was accompanied by endorsements from theater commanders and a mass of testimony from the front regarding the need for these aircraft.[27]

In spite of the earlier indication that such organic aviation missions might be acceptable, the new deputy commander of the AAF, LTG Ira C. Eaker, renewed the claim air forces liaison squadrons should perform all liaison missions except for Field Artillery.[28]

The new commander of the AGF, GEN Jacob L. Devers, strongly supported the proposal to expand organic aviation, as did also the chief of staff of the Army, GEN George C. Marshall.[29] In a memorandum to the commanding general of the AAF, GEN Marshall observed he had studied the matter and strongly suggested the AAF "go along with this wholeheartedly and not reluctantly."[30]

GEN Devers then met with the deputy commander of the AAF. They emerged from the meeting with an agreement for an even greater expansion of organic aviation than originally requested.

In the agreement approved by the War Department on 9 August 1945, six (instead of five) light planes were to be assigned to each infantry, airborne, and mountain division; nine to each armored division; seven to each cavalry division; two to each cavalry squadron and separate tank battalion; one to each separate engineer battalion; and two to each cavalry group and tank destroyer group. Since more appropriate aircraft had not been produced, the planes were to be L-4s and L-5s.[31]

The war came to an end on 14 August 1945, a few days after the expansion of organic Army Aviation was authorized. In the meantime, the AGF had proceeded to gather evidence from the field to support requests for the extension of organic aviation to include ground reconnaissance as well as other uses which had been and could be made of light planes.

Convincing evidence was collected and tests were conducted supporting the use of L-5s for

The L-4 uses a German Autobahn for an airstrip in 1945.

Corporal Beahan, the first WAC instructor in the Department of Air Training's Maintenance Division, explains carburetors to a class of students.

close-in bombing and reconnaissance at night; as a moving platform for rocket launchers and for the new recoilless gun; and for dropping supplies and evacuating wounded. The war ended before the results of most of these studies and tests could be reviewed adequately or implemented in a systematic fashion.[32]

The maximum number of organic Army aircraft in service during WWII is not easy to determine. Statistical records on equipment during the war were less complete than during later periods, and many of the records collected had subsequently been lost. According to a widely cited study by a U.S. Air Force historian, 750 air observation post sections had been activated by the end of January 1944; about "1,600 suitable liaison aircraft were available."

During the following year, the acquisition of 100 aircraft per year was intended to replace those lost through attrition. For most of 1945 and the early part of 1946, about 175 aircraft per month (with the ratio of six L-4s to one L-5) were acquired by the AGF.[33]

If the attrition rate averaged about 100 per month during 1945 and declined significantly during early 1946, the maximum number of organic Army aircraft may have approached 3,000. Of this number, as many as 300 were probably L-5s. The estimated total of about 3,000 is supported by the artillery air operations reports of the armies operating in Europe in 1945.

These reports enabled The General Board, U.S. Forces, European Theater, to report "approximately 1,380 Field Artillery aircraft were operating in the European Theater as of 1 May 1945."[34]

Also, according to Andrew Ten Eyck, writing in 1946, "organic Field Artillery air observation . . . [came to have] more than 3,000 assorted Piper L-4s and Stinson L-5s in 1945."[35]

In early 1946, through disposition of aircraft by the Surplus Property Board and otherwise, the number of aircraft in the inventory of organic Army Aviation rapidly declined. The inventory apparently fell below 300 before the Army began purchasing L-16s and L-17s in late 1947.[36]

Army Aviation Training, 1943-1945

COL William W. Ford continued as director of the Depart-

L-4s line up at Fort Sill, OK.

The Brodie device connects an L-5 used for aerial observation to a ship in the Pacific.

ment of Air Training at Fort Sill, OK, until January 1944, when he was given a field command. MAJ Wolf was executive officer until COL Ford's departure, when, with the rank of lieutenant colonel, he became director.[37]

Private contractors under the auspices of the AAF continued to conduct primary flight training for AGF pilots. However, this training was discontinued at Denton, TX, in November 1943 and conducted only at Pittsburg, KS, until the end of 1944.

The AAF then terminated its contracts with the civilian flying schools. Beginning in January 1945, the AAF used its instructors to conduct primary flight training for AGF pilots at Sheppard Field, TX.[38]

Relations between the AAF and AGF concerning the training of ground forces personnel were less stormy between 1943 and 1945 than before or what occurred later.

From mid-1942 through 1945, flight classes generally began every 2 weeks; the class size usually ranged from around 20 to 40 students—depending on the need for pilots at a particular time. The primary phase of the training lasted from 11 to 14 weeks, and the advanced phase, conducted by the AGF at Fort Sill, from 5 to 14 weeks.

The length of the courses had to be shortened from time to time because of serious shortages of trained pilots at the front. According to one respectable study, 2,630 pilots and 2,252 mechanics had been trained by the end of WWII.[39]

There were two significant additions to the training conducted at Fort Sill during the latter part of the war. First, seaplane training was inaugurated for pilots and mechanics in April 1944. Second, the Department of Air Training began conducting training on the use of the Brodie device in October of that year.[40]

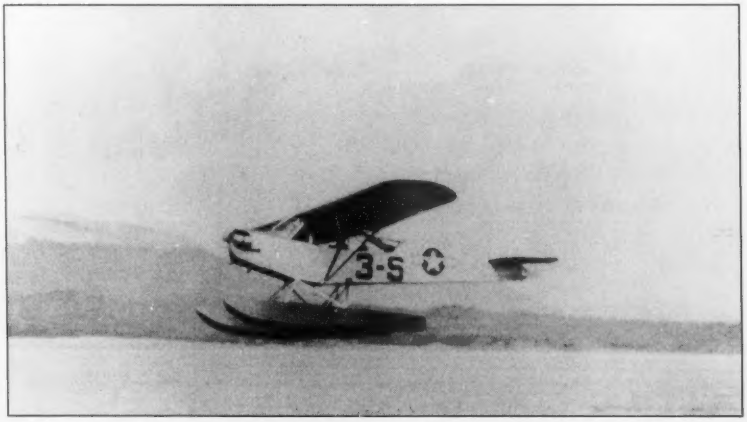
On 7 December 1945, the Department of Air Training of the Field Artillery School was redesignated as the AGF's Air Training School. The commandant of the Field Artillery School, Major General Louis E. Hibbs, was named commandant of the new training school. COL William W. Ford was named assistant commandant for air training. The AAF continued to provide the primary flight training at Sheppard Field until May 1946.

During the course of WWII, organic Army Aviation gained the acceptance and acclaim of almost all AGF leaders. From 1943 until the end of the war, field commanders incessantly requested more organic aircraft. Even the AAF came to accept the validity of the fundamental concept of organic aviation.

In the last major wartime air forces attempt to takeover in January 1944, for example, GEN Arnold proposed to leave the liaison aircraft under the field control of the ground forces units to which they were assigned, while establishing AAF ownership of planes and personnel.

The very survival of organic Army Aviation, throughout the war and the subsequent period of demobilization, was itself a significant achievement, as well as a tribute to the WWII era pioneers. This was especially true in the face of the initial skepticism of many ground leaders and the determined opposition of the AAF.

The successes of these pioneers on the battlefield, on planning boards, and in the Pentagon ensured Army Aviation would live on and be afforded more opportunities to prove itself. ❐



An L-4 on floats conducts sea plane training in 1944.

Endnotes

1. Part I of this study, covering 1940 to 1943, was published in ***U.S. Army Aviation Digest,*** May-June 1992.

2. Kent Roberts Greenfield, ***Army Ground Forces and the Air-Ground Battle Team, Including Organic Light Aviation*** (Study No 35, Historical Section, Army Ground Forces, 1948), pp. 64-65.

3. MG Ray E. Porter, assistant chief of staff, G-3, for deputy chief of staff, Memo WDGCT 452.1, 7 February 1944, subj: liaison aircraft in AGF, copy in Aviation Branch Command Historian Office (ABCHO).

4. Ken Wakefield and Wesley Kyle, ***The Fighting Grasshoppers: U.S. Liaison Aircraft Operations in Europe, 1942-1945*** (Leicester, England: Midland Counties Publications, c. 1990), pp. 45 and 75, passim; Richard Tierney and Fred Montgomery, ***The Army Aviation Story*** (Northport, AL, c. 1963), p. 224.

5. CWO Delmont Scott (ret), who served as an aircraft mechanic in 4th Depot Army Unit during WWII, reported to the author that the AGF were using two L-5s in North Africa in 1943 (interview, Enterprise, AL, 5 June 1992), ABCHO.

6. GEN H. H. Arnold for CSofA, memo, 29 January 1944, subj: liaison aircraft in AGF, ABCHO; Greenfield, loc. cit.

7. BG I. H. Edwards for commanding generals of AAF and AGF, Memo, WDGCT 320.2 (2-5-42), 6 June 1942, subj: organic air observation for Field Artillery, ABCHO.

8. Greenfield, op. cit., p. 60; Robert F. Futrell, "Control of Observation Aviation: A Study of Tactical Air Power," (unpublished manuscript, U.S. Air Force Historical Study No. 24, Air University) pp. 49, 65-67, passim; transcript of interview with LTG Robert R. Williams (ret) by COL Ralph J. Powell and LTC Philip E. Courts (Carlisle Barracks, PA, 1978), pp. 7 and 9.

9. The General Board, United States Forces, European Theater, "Liaison Aircraft with Ground Force Units," (unpublished study, 1945), ABCHO; Andrew Ten Eyck, ***Jeeps in the Sky: The Story of the Light Plane*** (New York: Commonwealth Books, Inc., 1946), pp. 63-64. Reports stated some AAF liaison flights were sent to China-Burma-India Theater in 1943, but these were probably some previously authorized AAF observation squadrons already organized and deployed.

10. LTG Lesley J. McNair for CSofA, memo, 16 February 1944, subj: liaison aircraft in AGF, ABCHO.

11. Porter, op. cit., 28 March 1944.

12. Greenfield, op. cit., pp. 66-67.

13. Wakefield and Kyle, loc. cit.

14. Ten Eyck, op. cit., p. 44. According to Ten Eyck, about 1,000 L-4s were flown across the channel with auxiliary fuel tanks during the invasion.

15. Wakefield and Kyle, op. cit., pp. 65-71; Tierney and Montgomery, op. cit., pp. 153-54.

16. COL Delbert Bristol (ret), transcript of interview conducted by COL Ralph J. Powell and Ronald K. Anderson, 1978, p. 12; Greenfield, op. cit., pp. 101-02.

17. Ten Eyck, op. cit., pp. 49-50, passim; Wakefield and Kyle, op. cit., pp. 77-98.

18. General Board, op. cit., pp. 14-22.

19. Ten Eyck, op. cit., pp. 47-53, passim; Devon Francis, ***Mr. Piper and His Cubs*** (Ames, IA: Iowa State University Press, 1973), pp. 111-15; Tierney and Montgomery, op. cit., pp. 157-64, 167-73; Herbert P. LePore, "Eyes in the Sky: A History of Liaison Aircraft and Their Use in World War II," ***Army History***, No. 17 (Winter 1990-91), pp. 35-37.

20. Ten Eyck, op. cit., pp. 44, 59-60.

21. "Brodie System," a USAAVNC Technical Library bound manuscript with copies of documents about developing, testing, and using the Brodie device, authorship unknown.

22. General Board, op. cit., pp. 3-4.

23. Greenfield, op. cit., p. 106. No entirely satisfactory explanation could be found for this about-face on the part of the AAF. One suggestion is the deputy commander, LTG Barney Giles, was expressing his opinion and not that of GEN Arnold. While this theory may have an element of truth, it also seems probable the AAF's position in October 1944 was partly influenced by overriding concern to most air forces leaders—the separation of the AAF from the Army. A more conciliatory position on the role and mission of organic Army Aviation may well have been perceived, at that particular time, as a means of achieving this AAF goal.

24. Ibid., pp. 104-08; Tierney and Montgomery, op. cit., pp. 225 and 238.

25. Greenfield, op. cit., pp. 109-110.

26. Ibid., p. 110; Note from LTG Williams to Dr. John Kitchens, April 1992, "Williams File," ABCHO. Headquarters, Tactical Air Command, "Study of Liaison Aircraft Activities" (unpublished manuscript, 19 March 1948), pp. 4-5, ABCHO.

27. MG J. G. Christiansen, Memo 353/140 (FA Air Obsn) (S) 24 May 1945) GNGCT-15, for CSofA, subj: liaison type aircraft, ABCHO; General Board, op. cit., p. 6.

28. LTG Ira C. Eaker, Comment No. 2, DF WDGCT 452.1 to G-3, op. cit., 27 June 1945; Greenfield, op. cit., p. 112.

29. LTG McNair was killed by American bombs dropped short of the line while he observed the battlefield in France, July 1944.

30. "Williams Interview," op. cit., pp. 26-27; MG I. H. Edwards and MG C. C. Chauncey, Memo WDGCT 452.1, op. cit., 12 July 1945.

31. Greenfield, op. cit., p. 113; Tierney and Montgomery, op. cit., p. 77.

32. Greenfield, op. cit., pp. 111-12.

33. R. Earl McClendon, ***Army Aviation, 1947-1953: Air University Documentary Research Study*** (Maxwell Air Force Base, AL: Air University, 1954), p. 5; Greenfield, op. cit., p. 108.

34. General Board, op. cit., p. 1.

35. Andrew Ten Eyck, op. cit., p. 60.

36. McClendon, op. cit., p. 2. McClendon's estimate is too low of "something less than 200 individual aircraft" during National Security Act of 1947; MG E. E. Partridge to CG, Air University, 5 January 1948, subj: liaison aircraft, ABCHO; "Inventory of Army and National Guard Aircraft," Office of Chief of Transportation, 1 April 1958, ABCHO.

37. COL Ford, ***Wagon Soldier***, pp. 127-27; Biographical sketch of COL Wolfe, ABCHO.

38. Tierney and Montgomery, op. cit., pp. 75-76.

39. Tierney and Montgomery, op. cit., pp. 76-78; Richard P. Weinert, Jr., ***A History of Army Aviation, 1950-1962*** (Ft. Monroe, VA: U.S. Army Training and Doctrine Command, 1991), pp. 9-10.

40. Ibid., Weinert, p. 9; Tierney and Montgomery, op. cit., p. 76; COL Ford, op. cit., pp. 148-50.

Capabilities and Expectations

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The Cold War is over . . . no longer does the East European communist threat exist. The United States is in the process of demobilizing its military forces as does any victor when his ends have been attained. Besides demobilization, our military forces are being reduced because of Congressional budget cuts. These cuts spell the loss of many of the capabilities the military services are used to having. With this loss in capability, the entire U.S. military establishment needs a new vision that can mean a larger, more important role for Army Aviation.

The principal tools the United States used to fight the Cold War—technology and force readiness—gave us an edge we maintained for over 40 years. For this long period, the Cold War shaped principal U.S. military investments, costly but necessary, as we prepared to fight massive, European battles.

With communism now disappearing as a form of government worldwide, the threat of large-scale battles is dissipating. It is not likely, however, that this change will eliminate the risk of war. It is more likely that the hidden risks such as nationalism, religious fanaticism, and minority conflicts will continue to appear as headline news.

Development of these less-familiar risks can easily create security risks for the United States and its allies. In the past, expectations of carnage, which normally would occur with massive battles between two super powers, acted as a deterrent to war. With the end of the Cold War, however, the simple, bipolar system of security that the world had become familiar with died. Thankfully, no bloodletting battles came about as a result of the Cold War.

As military planners envisioned battles, they would have taken place primarily with forward-stationed equipment, ranging from armored battalions to tactical nuclear weapons. Most of the equipment that would have been used for the first set of battles was already pre-positioned in Europe.

The future battles our military forces face are obviously no longer the same as they were only a few short years ago. Today the threat is spread around the world and, in most cases, far less defined. The United States must be ready to deal with these threats anywhere in the world on short notice. It is not feasible to pre-position and maintain contingency forces and equipment over the face of the globe.

Further, the new threat is armed with some of America's own latest technology. Through the worldwide proliferation of weapons of all types and quantities, many of our potential enemies are equipped equally as well as our closest allies; however, we do not know for sure who our enemies or our allies will be in 5 years.

This unknown threat is what we must now measure: We must specialize our approach to deterrence. The future threat is potentially too dangerous for us simply to assume that it will never do us harm. Indeed, the investments we make today will affect our warfighting ability tomorrow.

Force projection response to the threat is not new to the Army. The Army has numerous weapon systems that give it the capability of projecting U.S. power for quick, decisive victories. Many of these systems are strategically deployable, operationally mobile, and tactically lethal.

An excellent example of the Army's integrated use of these systems for responsive force projection is Operation Just Cause. During this operation, U.S. military units, overnight, silently moved Infantry and Special Forces units thousands of miles for an assault against the country of Panama.

More impressively, units also moved AH-64 Apache helicopters into position. The latter positioning enabled attack helicopters to be in combined arms action with the Infantry from start to finish.

The U.S. military cannot afford to be less responsive to the new threat than it was to communist Europe. We must be able to rapidly deploy a lethal and versatile force at the strategic level: force projection.

The public's expectations of U.S. military capabilities will not diminish proportional to budget cuts. Nor do we do want it said one day that the military effectiveness of the United States peaked in February 1991. We must look for new, more efficient ways of projecting our military force across the globe. We must spread our capability across the entire smaller force that remains after the military drawdown.

Joint operations, using the best of each military service, is one way to effect synergy and be militarily successful in the future without overspending the budget. The Department of Defense (DOD) should emphasize the Army's tactical, operational, and strategic effectiveness as a part of the joint services with the use of attack, utility, cargo, and reconnaissance helicopters.

Army Aviation should be used to its maximum potential in joint operations as it currently is used on the combined arms battlefield. It is time to recognize Army Aviation's status as a combat maneuver element, not only within the Army but within our sister services.

Army Aviation possesses valued qualities enabling it to assume roles and missions now not singularly assigned to the other services. It must take on new roles and missions, not only during Army combined arms missions, but during joint service operations.

Army Aviation also can assume added missions for its sister services, which would create new joint service operations. DOD and the Army must allow Army Aviation to venture away from acting merely as a combined arms team player. Aviation must seek out opportunities beyond those that it is now comfortable with and be a principal player on the joint arms team.

One way Army Aviation can increase the effectiveness of its sister services is by opening up safe corridors for tactical or strategic jet aircraft strikes. This mission is currently known as joint suppression of enemy air defense (J-SEAD). During the initial phases of the Desert Storm, air war Apache helicopters opened up air corridors for the U.S. Air Force. This use of the Apache was a first but should not be viewed as a one-time opportunity unlikely to repeat itself. The Army, with its attack helicopters, is uniquely qualified to conduct the J-SEAD mission. It should be standard operating procedure to clear a path across dangerous air defense belts using these assets.

Another example of Aviation's contribution to the effectiveness of another service is the use of the armed OH-58D Kiowa Warrior to enhance security and firepower for U.S. Navy vessels. The Army has been flying the armed Kiowa off the decks of ships for over 4 years.

Oceangoing fleets lack the capability to effectively defend themselves in confined waters such as the Persian Gulf. Large, modern warships need oceans to exercise conventional naval tac-

OH-58D Kiowa Warrior fires a Hydra 70 rocket over water.

UH-60 Black Hawk

tics. Denied these deep, blue waters, the requirement exists for small, armed aircraft for the fleet to operate close to land. The fleet's needs include protection in close proximity to the ship, reconnaissance patrol capability, and a means to strike swiftly at enemy patrols.

The small size of the OH-58D—combined with weapons, such as the HELLFIRE (Heliborne Laser Fire and Forget missile system), guns, and rockets it carries—makes an ideal system to fulfill this role. The Army could continue to fill this void within the Navy's requirements, which would save the Navy from having to invest in a mission that it might not perform on a permanent basis.

One more possible use of Army Aviation in joint roles is assisting with counterdrug trafficking operations. During Operation Blast Furnace in 1986, the mere presence of the U.S. Army in Bolivia virtually shut down all drug trafficking for the duration of the Army's stay. The mobility and tactical intelligence gained from the high-profile, UH-60 Black Hawk operations in support of this mission proved invaluable.

This same resource, the UH-60, could supplement U.S. Coast Guard activities on a regular basis to patrol our national borders.

Yet another possible mission could be security operations for Marine Corps amphibious assaults. The possible joint missions for Army Aviation are limited only by its leadership's willingness to coordinate at the joint level. Army Aviation is capable of offering resources to the other services that could save DOD dollars. It is not logical for two services to duplicate similar capabilities at a time when money and personnel are so scarce.

None of this is to say that Army Aviation is in need of any new missions. Army Aviation's resources are justified as a combat arms branch within the Army in their more familiar roles within combined arms operations on the traditional battlefield.

In this era of diminishing resources, however, all services must cooperate and work together so that they can accomplish what they need to do in the most efficient way possible. The federal budget will not provide enough money for every service to have its own individual answer to the same problem. If the need for a certain resource is genuine, and has priority, the need will be answered. If that need involves rotary wing aircraft, Army Aviation should get involved and address the need now. If it does not get involved, the dollars to fulfill the requirement will be taken out of Aviation's manpower and inventory resources and given to another service when that other service addresses the problem.

As we approach the 21st century, the world is looking very different than it did for most of the past century. Our success in Desert Storm was a result of armament and training decisions made 10 years ago. These decisions bought overwhelming military resources, but at a correspondingly high cost to the federal budget.

The U.S. Congress now has decided that it will not spend as much on defense in the 1990s as it did in the 1980s. To compensate for this decreased budget, the U.S. military will need a new, innovative approach to maintain deterrence and readiness so we are properly prepared to fight.

Army leaders must do all we can to ensure we maintain a capable fighting force with the "less" we are going to have. Today's decisions will determine if we are successful 10 years down the road. The Army, with Aviation as a principal player, has what it will take to ensure U.S. military forces will be ready and able, with the capabilities needed, to match the expectations of the American people. ❐

Simulation And Training

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A great deal of credit for the superb performance of Army Aviation during Operation Desert Storm must be given to training through the use of simulation. Most of the AH-64 Apache crews had never fired a HELLFIRE missile in the aircraft before going to combat. Yet, the gunnery training they had received in the AH-64 Apache Combat Mission Simulator enabled them to achieve an amazing hit rate when it became necessary to shoot for real. Army Aviation now has an elaborate suite of training aids, devices, simulators, and simulations (TADSS) designed to train knowledge and skills required to accomplish the mission. Those tasks trained through the use of TADSS are readily transferrable to the aircraft. Operations Just Cause and Desert Storm have proven training with simulators to be a very effective way to train.

Collective Training

As aircraft and weaponry become more complex and sophisticated, materiel and operational costs will increase. Even without budget restraints, conducting training will become much more difficult. Lack of training areas, adequate firing ranges, and eye-safe lasers will drastically restrict the conduct of training.

Aviation also must look beyond individual and crew training. Up to now, we have trained individuals and crews very well, but we have not trained them to operate as a team. Collective training is now a must.

Initial Qualification and Sustainment Training

Aviation also must take a close look at the different requirements for initial qualification and sustainment training. In the past, TADSS were acquired for initial qualification in the schoolhouse. These TADSS were duplicated and sent to the field for sustainment training. Qualified aircrews in the field do not require the same training as required for learning to fly the aircraft. Future devices must be able to network with other devices to train those tasks required for team operations.

Four Basic Trainers

Today's aircraft training system is comprised of four basic components—classroom systems trainers, cockpit procedures trainers (CPTs), flight simulators, and the aircraft itself. These components will not change; however, a totally new approach to their development and use is evolving. The present classroom systems trainers vary drastically in type and use. Interactive video trainers and panel board trainers are quite common.

Each trainer is designed to train specific tasks and offer limited use. For example, a separate trainer is required for electrical systems, engines, hydraulics, fuel, and other systems that must be trained. These training devices are expensive and difficult to upgrade. Normally, these trainers lag far behind as changes are made to the aircraft. In many cases, the trainers are so far behind they result in negative training.

Computer-Based Instruction

The new approach is to replace existing trainers and develop new trainers, using computer-based instruction. Industry has demonstrated its ability to develop computer-based classroom trainers to replace current systems at a fraction of the cost of replacing or updating present equipment. Once the system is in place, one changes subject matter by simply changing software.

The computer-based trainer may be used to train the CH-47 Chinook hydraulics system today and the OH-58 Kiowa electrical system tomorrow. Another great advantage is that the instructor can make rapid changes to the software as the aircraft changes, whereas today's systems sometime require as long as 18 months to change. A computer-based trainer also solves the problem of keeping personnel in the field current. As changes are made in the schoolhouse, computer disks with the changes are sent to the field. The idea is to acquire computer-based classroom systems trainers on an institutional basis rather than by specific aircraft system. Systems trainers will shorten the acquisition time and result in a lower training cost.

Cockpit Procedures Trainers

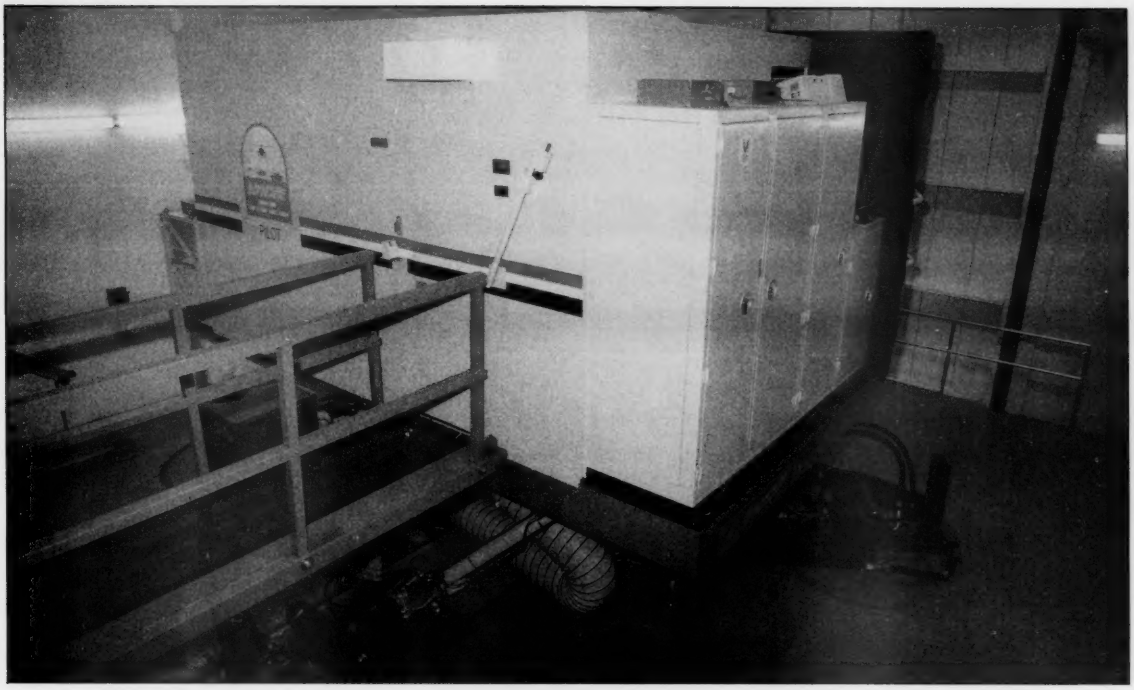
The CPTs, which are used primarily for switchology training, also must be developed to take advantage of technological changes for increased training benefits. One major requirement of new CPTs is rapid reconfigurability. These trainers must keep pace with the aircraft they support to ensure students are taught the right way the first time. Time and money required to change present CPTs have caused, and will continue to cause, training problems until the system is fixed.

CPTs also must be mobile and transportable. When an aviation unit deploys or relocates, its training requirement does not disappear. Units must be able to continue training; therefore, mobile and transportable training devices are a must. CPTs or part-task trainers must be fielded to provide sustainment training. Some skills decay very rapidly if not practiced and devices must be provided to reinforce these skills. Lower order, lower cost devices may serve this purpose. The AH-64 Apache program is now under contract for a front-seat switchology trainer for each Apache battalion to keep crews current on front-seat operations.

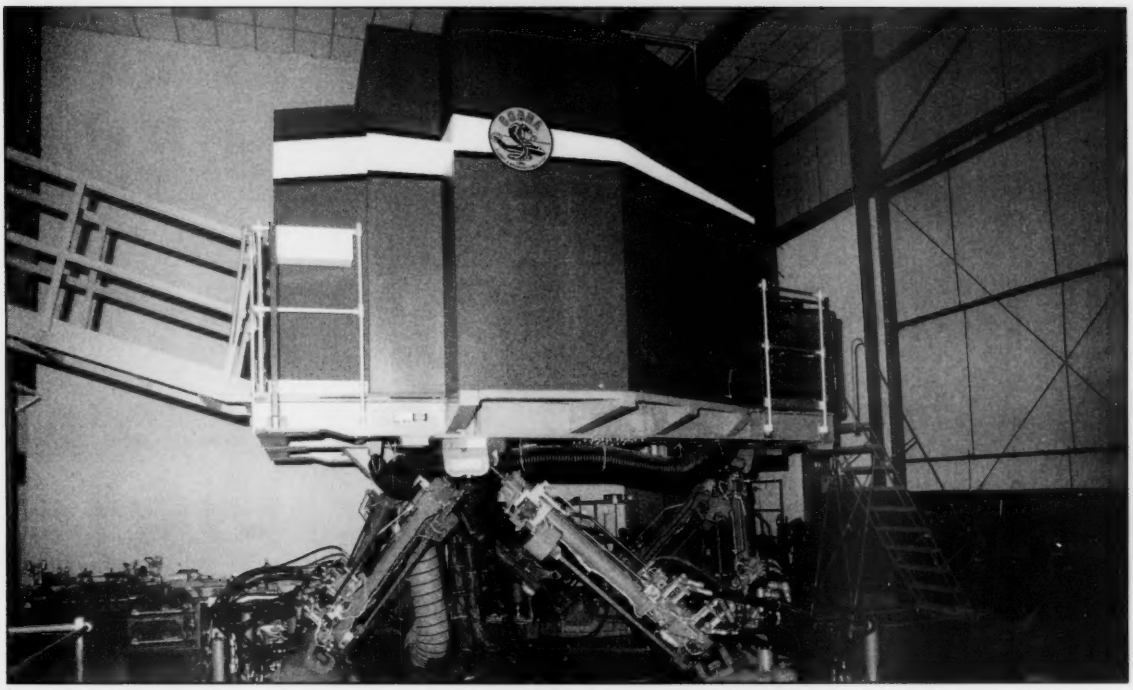
Today's aircraft training system is comprised of four basic components—classroom systems trainers, cockpit procedures trainers, flight simulators, and the aircraft itself.

Future Flight Simulators

Major changes will occur in the development and fielding of flight simulators. All Army Aviation simulators are motion based. Except the UH-1, all Army Aviation simulators also are equipped with a visual system. Elaborate brick and mortar facilities are required to house these devices. The Military Construction, Army window is 5 years, which creates major problems in fielding simulators when the force structure is changing rapidly. Simulators for the future must not depend on brick and mortar construction; they must be capable of either being mobile or easily transportable.



AH-64 Apache Simulator



AH-1 Cobra Simulator

AH-1 Cobra Simulator—Cockpit View

The initial cost for a simulator motion system is minimal. Motion-based simulators must be fixed; the facility cost plus the life-cycle cost of maintaining the system becomes very expensive. It also is a lengthy, expensive process to relocate a fixed-based simulator. It would have been great to have simulators in Southwest Asia to trainup for Operation Desert Storm. However, it was impossible to relocate existing simulators in time to be of any benefit.

Meeting Future Training Needs

To meet future training needs, nonmotion mobile and transportable simulators must be developed and fielded. The added training value of a motion system has not been proven. Many motion versus nonmotion studies have been conducted and none have proven conclusively that motion is necessary for training. Appropriate motion cues must be provided. These cues can be provided by seat shakers and gravity-seats without a full-motion system.

State-of-the-art, full-motion simulators will still be required for initial qualification in the schoolhouse, when a high degree of fidelity is required for training new skills. Lower order, nonmotion, mobile and transportable devices will be developed with enough fidelity to meet field sustainment training needs. As previously mentioned, these devices must be capable of networking with other devices for team training.

The ultimate training device is the real aircraft. Each aircraft can readily become its own training system through the use of embedded training. This training can be conducted during actual flight or on the ground, using external power sources without the blades turning. Embedded training has some very distinct advantages.

The training package is a part of the aircraft that eliminates the need for extensive facilities required to house training devices. Training can be conducted along with routine mission flying. A major plus is the realism added by training in the actual aircraft.

Mission Rehearsal

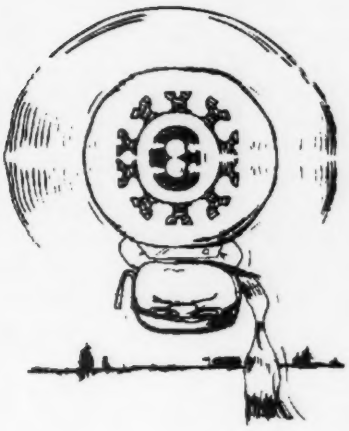
Simulators and training devices capable of mission rehearsal are a must. Mission rehearsal is the practice and honing of tactics for a specific mission before mission execution. Mission rehearsal differs from mission training when personnel experience a wide variety of representative missions and are then qualified for an infinite number of missions they may face. Mission rehearsal takes training one step further and provides qualified personnel the chance to experience the specific simulated environment, to include interaction with other aircrews and/or other service components; the threat environment; and the physical characteristics of the specific mission area. Mission rehearsal can provide valuable feedback to decisionmakers on risks involved and probability of mission success.

Today's technology has made mission rehearsal capability available. It will become an essential element of training programs of the future.

Conclusion

The training capabilities provided by present and emerging simulation technology are limited only by aviation's ingenuity in the use of simulation. Simulation must now bridge the gaps in aviation training that will result from limited resources. ❐

Simulators Make Me Sick



Captain Thomas Willmuth
Aviation Officer Advanced Course, Class 92-1
Fort Rucker, AL

"Before landing complete, sir." Man, it feels like I have 50-knot crosswinds. I shouldn't have stayed up so late, my head feels like it's going to explode. I feel like I've been on this mission a week and it's only been 2 hours. This aircraft just doesn't feel right.

"Load is oscillating fore and aft 10 feet; hook is hot, sir."

I wanted to be tough, but a tactical pinnacle at night, unaided, slinging 22,000 pounds of JP-4 (jet engine fuel) . . . . You might as well shoot me and get it over with.

"Missile alarm, 7 o'clock, he's got lock on, sir!"

"Breaking right, firing flares."

"Master caution! Fire on two, sir!"

"Chief, check two for fire. Thrust adjust, normal beep number one and two increase, cockpit windows . . . ."

"Fire on two!"

"Number two engine condition lever to stop, pull fire control handle, engage fire bottle one." I feel like throwing up . . . chocking.

"You're losing rotor RPM [revolutions per minute]."

"Missile alarm, 6 o'clock!"

"I'm breaking left behind that . . . ."

"Load is off 10 feet, sir!"

"Release the load!" Crap, we're dead.

And the aircraft goes up in a ball of flame because the pilot wanted to see what would happen if he tried to land with six blivets of JP-4.

Mr. Harrison always knew just what to say to make me feel good. I didn't feel too bad until after I finished the scenario in the synthetic flight training simulator. It took a long time for my eyes to adjust to real-world light and objects. Everything was a little blurry, and I felt a little weak in the knees.

Symptoms

This pilot is experiencing simulator sickness. Simulator sickness is a form of motion sickness, that sometimes occurs during simulated flights. Usually, simulator sickness is induced either by physical or visual motion, or by some unusual combination of these two sources of motion information.

The severity of symptoms may differ from one person to another. Because sickness causes deterioration of performance and training effectiveness, it is important to detect symptoms early before they become acute. Symptoms include: leaning and staggering, dizziness, confusion, disorientation, vertigo, drowsiness, fatigue, depression, apathy, eye strain, blurred vision, feeling of warmth, vomiting, nausea, difficulty focusing eyes, stomach distress, burping, loss of appetite, difficulty concentrating, and flashbacks.

Of course most people do not experience any symptoms of simulator sickness. Contributing factors that make some more vulnerable than others to simulator sickness include hangovers, sleep loss, flu, upper respiratory illness, head colds, certain medications, ear infections, ear blocks, upset stomach, lack of physical conditioning, and emotional stress.

Vulnerability

Aircrews who are new to simulator flying, regardless of flight time, seem vulnerable to simulator sickness, especially those pilots with extensive flight time but little or no simulator time. These aviators experience cues and vestibular stimulation like that experienced in actual aircraft, but responses are only ***nearly*** identical to the aircraft they fly, particularly those responses that mismatch outside visual cues versus instrument readings, balance organ inputs, and body position pressures.

Contributing Factors

The quality of the simulator is one of the greatest contributing factors to the likelihood of experiencing simulator sickness. Incorrect positioning of the visual projection on the screen in the cockpit will contribute to mismatched visual cues. The adjustment of the screens usually are not for the benefit of the unit trainer's (instructor's) position; he should, therefore, minimize the amount of time spent viewing the visual screen.

Recent studies of Army visual simulators show the UH-60 Black Hawk simulator presents the highest incidence of simulator sickness. The CH-47 Chinook simulator presents the lowest incidence of simulator sickness. Sickness is evidenced by severe visuomotor, nausea, and disorientation. Why? Among other reasons, mission scenario, steep turns close to the ground, and abrupt changes in attitude contribute to this difference.

Prevention

Besides avoiding the contributing factors listed, some general guidelines for preventing simulator sickness are as follows:

- Minimize changes in orientation when close to the ground, especially when turning.
- Minimize rapid changes in altitude, abrupt rolls, and "porpoising."
- Avoid freeze situations in early training stages. If that is not possible, recover to straight and level flight before entering the freeze situation.
- If all else fails, disable motion base, discontinue visual flight, and conduct instrument training.

Policies

Because simulators are so different and the effects on aviators vary, policies among the services differ. In the U.S. Army, the policies are often established at brigade or higher level and they are quite varied.

The U.S. Air Force has no policy regarding simulator flight sickness.

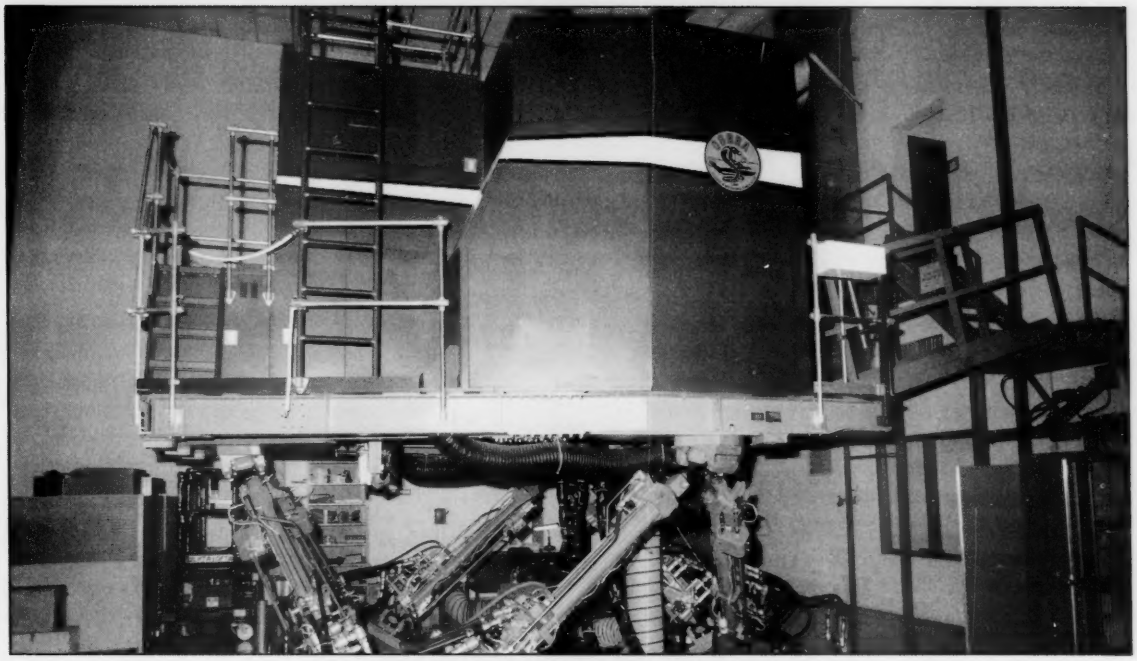
U.S. Navy policy orients on the individual pilot. Flight personnel who experience motion sickness merely abstain from actual aircraft flight that same day. Naval personnel are not to schedule flight personnel who have past experiences of motion sickness to fly 24 hours after simulated flight.

The 2d Marine Air Wing policy is that the maximum length of a visual simulator sortie, without a break, is 2 hours. After completion of any visual simulator flight, the chain of command provides the aircrew the opportunity for an uninterrupted night's sleep before participating in an actual flight.

Aviators assigned to the 3d Marine Air Wing are grounded for 24 hours after their first visual flight. Following the next four visual simulator flights, aviators cannot fly for 4 hours. Pilots who experience no simulation sickness after the fifth hop have no restriction.

Canadian Air Force aviators are restricted from actual aircraft flight for 2 hours after simulated flight. If the aviator experiences simulator sickness, he cannot fly for the rest of the day.

Extensive research and study continue regarding simulator sickness and those affected by it. The varied policies among and within the services illustrate that we are



AH-1 Cobra Flight Simulator

not in unison concerning this complex issue.

Establishing policy on post simulated flight recovery is best at the lowest possible command level. Higher level policies are more likely either to unnecessarily hinder aviators to protect the worst case or inadequately cover possibilities that may jeopardize aircraft safety. Professional aviators best achieve maximum safety, program efficiency, and flexibility by using practiced, sound judgment. ❐

Previous Synthetic Flight Training System (SFTS) Articles

The following articles are available upon request by writing to the Editor, ***U.S. Army Aviation Digest***, ATTN: ATZQ-PAO-AD, Fort Rucker, AL 36362-5042:

- "The Missing Link," January 1961
- "Synthetic Flight Training," July 1967
- "It'll Never Get Off the Ground," May 1970
- Synthetic Flight Training System," September 1972
- "View From the Training Base," November 1974
- "The Wonderful World of Simulation, February 1975
- "Flight Simulator Specialist Course," March 1975
- "A New Approach to Flight Simulator Acceptance," April 1976
- "SFTS: The Shape of Things to Come," April 1976
- "Tactical Training in the SFTS," April 1976
- "The Professional and the Simulator," October 1976
- "Training Development at Fort Rucker," March 1978
- "Flight Simulator Reflections," August 1979
- "Hi, I'm a Distraught Flight Simulator," October 1979
- "The Real Thing," October 1980
- "AH-1FS: One Step Closer to Reality," October 1980
- "Synthetic Flight Training System Program," November 1981
- "You Can't Hardly Tell It From the Real Thing," September 1983
- "Flight Simulation—The Alternative," October 1983
- "Flight Simulation," March 1985
- "Flight Simulator Sickness, April 1986
- "Flight Simulators—Past, Present, and Future," November 1988
- "Army Aviation Flight Simulator Update," November 1988
- "Simulator Sickness or I'm OK, You're OK, It's the Simulator That's Different," November 1988
- "Multisim," November 1988

Sudden Thunder

Sergeant Wayne V. Hall
49th Public Affairs Team (Airborne)
Fort Bragg, NC

The AH-64 Apache helicopter proved itself an effective attack helicopter during the war in the Persian Gulf. Although its worthiness is well known, the pilots who fly this aircraft must train constantly so they are prepared for any mission.

Apache pilots participated in the training of "Exercise Sudden Thunder," held at the Outlying Field (OLF) Atlantic near the U.S. Marine Corps Air Station, Cherry Point, NC, 29 March to 5 April 1992. Apache pilots from Company C, lst Battalion (Bn), 82d Aviation Brigade (Avn Bde), conducted training that differed from their normal operations.

"We started the exercise by flying a course of about 500 miles to reach OLF Atlantic, which served as our primary staging base during the entire operation," related Captain Jessie O. Farrington, commander, Company C, lst Bn, 82d Avn Bde. This base provided the AH-64 Apaches with every element of support they could possibly need, from ammunition to maintenance.

Sudden Thunder included several types of training. "We conducted day-and-night overwater flight, electronic warfare, and air defense artillery evasion training," said Chief Warrant Officer (CWO) Michael J. Brillant, company instructor pilot. "This training got these pilots used to and enhanced their capabilities for deployments overwater."

"Normally, we would train back at Fort Bragg, NC, over trees and woodland. While in the desert, we were able to train in that environment," commented CW2 Brillant. "In Exercise Sudden Thunder, we were moving into an environment completely different from what we

photo by Wayne V. Hall

AH-64 Apache crew performs reflight checks before takeoff.

already knew. This was the first time we had brought the Apaches here for training."

This exercise served as a training tool for the Apache pilots and gunners. One of the ways pilots can improve is through the use of Tactical Air Combat Training System pods.

"These pods simulate telemetry so the range complex can pick up the Apaches on computers," commented CW2 Brillant. "The data are then used during a debriefing at the end of training. This debriefing resembles that of the one depicted in the movie 'Top Gun.'"

Keeping the Apache in battle required a wide variety of support. OLF Atlantic provided the ability to strike many targets in a rapid manner, because it was a central staging area.

A staging base consists of an ammunition loading site, refueling point, mess site, and maintenance areas, as well as the helicopter parking area. A field site provides aviation ground crews several challenges that differ from a garrison environment.

"In a field environment, we can perform only limited maintenance on the helicopters," stated Sergeant (SGT) Michael F. Barriteau, AH-64 crewchief. "Our supply of parts and special tools in Exercise Sudden Thunder were not as adequate, so the maintenance conducted was only what was essential to keep the aircraft operating."

To provide the base with protection, the helicopter ground crews also must practice security. "When we were not fixing aircraft, the other noncommissioned officers and I conducted patrols, ambushes, and security positions to train some of the younger soldiers and provide security for the airfield," recounted SGT Barriteau.

One of the highlights of Exercise Sudden Thunder for the ground crews was an opportunity to learn new skills. "We were given a class by some marines on small boat operations for night-or-day infiltration to land from water," said Private First Class Douglas W. McCall, AH-64 crewchief. "They taught us how to work the boats, wear the suits, and use the other equipment involved in these operations."

Exercise Sudden Thunder provided the paratroopers of Company C an opportunity to broaden their horizons with essential training in unfamiliar areas. ❐

Captain Charles Pace
Training Research and Development Officer
Training Development and Analysis Directorate
U.S. Army Training and Doctrine Command
Fort Monroe, VA

DISTRIBUTED TRAINING PROGRAM

HELPS TO ANSWER ARMY'S CHALLENGE OF PREPAREDNESS

How is the U.S. Army answering its challenge of preparedness for any enemy, anywhere, anytime? Part of the answer lies in the use of advanced technologies associated with computers, videos, and teletraining.

The U.S. Army Aviation School, Fort Rucker, AL, will implement the first DTP OAC pilot course beginning with the first class in fiscal year 1993.

The U.S. Army's overwhelming victory over Iraq in Operation Desert Storm demonstrated the superior training our soldiers have received from the U.S. Army Training and Doctrine Command school system. Maintaining battlefield superiority, however, requires continued research, development, and acquisition of training methods and devices using the latest technology.

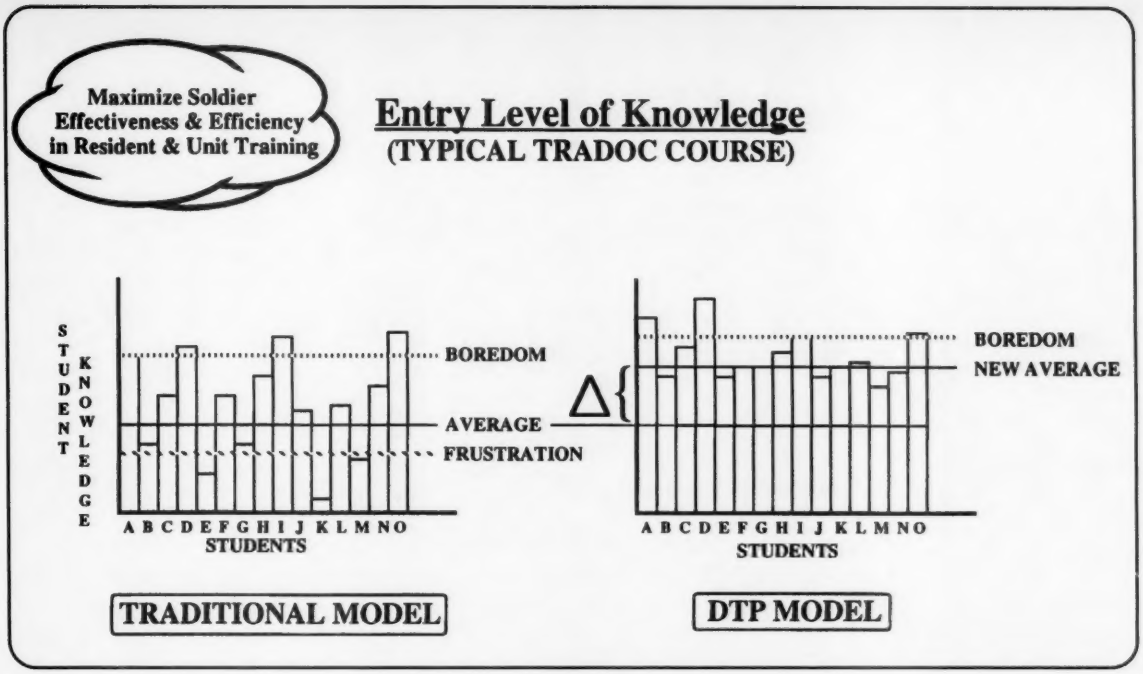
The challenge facing the Army with the approach of the 21st century: Be ready to deploy and fight well-equipped enemies around the world in conflicts that span the full spectrum of intensities with little or no warning. To prepare for the diversity of contingencies that may arise, the Army must continue to train to rigorous standards using the full scope of advanced training technologies. One example is the use of computer-based instruction, video tape, and video teletraining for individual and collective training.

Our soldiers proved the versatility of advanced training technologies in a military environment during Operation Desert Shield/Storm. Soldiers received live, interactive Arabic language refresher courses using video teletraining at their garrisons from the Defense Language Institute at Fort Ord, CA, before deploying to Saudi Arabia.

Reserve officers completed the unit movement officer course at their homestations; they used lessons provided by video teletraining and video tapes from the U.S. Army Transportation School and the U.S. Army Training Support Center, Fort Eustis, VA. Reserve units received critical movement information that facilitated deployment to Southwest Asia without sending their transportation officers to the resident course.

The Army's Distributed Training Program (DTP) applies several advanced training technologies, besides printed lessons, to update resident training and ensure continued soldier excellence. The program will enable soldiers to pursue pre-resident and sustainment training, as well as self-development and leadership development training, at their homestation.

DTP is now in the proof-of-principle phase. Several proponent school courses were selected as pilot classes for reconfiguration and distribution. These courses in-



The Distributed Training Program (DTP) will teach students an entry level of knowledge in advance. This, in turn, will become a common level of knowledge before the students attend a resident class. This common knowledge, indicated by the triangular Delta sign, will increase student learning, eliminate student frustration, and reduce boredom. Compared to the traditional model, the DTP model is an improvement: the new average shows a higher level of student knowledge; student frustration is eliminated; and the level of boredom is more difficult to reach.

clude 12 basic noncommissioned officer courses (BNCOCs), 4 advanced NCO courses, and 8 officer advanced courses (OACs).

Initially, pilots will consist of course lessons reconfigured for distribution using printed instructional material. Later, pilot classes will include advanced training technologies to modernize, improve, and enhance resident instruction and help distribute courseware to the field.

Beginning with the initial class in fiscal year 1993, the U.S. Army Aviation School, Fort Rucker, AL, will implement the first DTP OAC pilot course. Students scheduled to attend this class will receive a pre-resident package of instructional materials covering about 80 hours of current OAC instruction.

Students should receive the material at least 26 weeks before the course begins. Students must complete lessons and tests before attending the resident course.

Distribution of OAC course material will not shorten the resident portion of aviation OAC. The resident portion of instruction will remain 20 weeks and require the student to be in permanent change of station status.

DTP will promote training effectiveness by ensuring that all students enter the resident portion of aviation OAC with a common base of knowledge learned during pre-resident instruction. This common knowledge will reduce student frustration and boredom associated with repeating material already mastered by some students, yet new to other individuals (see figure).

Students arriving for the resident course will have a higher average knowledge level of course material. More knowledge will enable them to "hit the ground running" and proceed at a rate of instruction that stimulates, motivates, and challenges. Conversely, pre-resident instruction will enable students to proceed at their own rate to ensure maximum learning.

DTP will also enable soldiers to perform duties more effectively in their units and enhance unit readiness. Industry studies have demonstrated the use of advanced training technologies significantly increases knowledge retention and job performance.

For more information, contact the Army Distributed Training Office, U.S. Army Training Support Center, Fort Eustis, VA, DSN 927-2043 or commercial 804-878-2043 ❐

The Army Reprogramming Analysis Team

Mr. Norman H. Svarrer
Acting Chief for ARAT
Eglin Air Force Base, FL

The business of the Army Reprogramming Analysis Team (ARAT), Eglin Air Force Base (AFB), FL, is electronic combat (EC). Since every combat mission puts an aviator in an EC environment, the ARAT is an organization one should know intimately.

Vietnam, the Arab-Israeli Wars, and Desert Storm demonstrated the danger and complexity of EC warfighting. Radar, infrared, and optically guided aircraft-killing systems proliferate on the battlefield. Aircraft survivability equipment (ASE) is the onboard tool to assist in successfully operating in this complex EC environment.

The ARAT works to ensure the accuracy of the ASE threat identification and countering programs. The ARAT'S bottom line: enhance battlefield survivability.

Who Are They?

The ARAT is the Army's EC team of scientists, engineers, and intelligence analysts who program the most current and accurate threat information into the Army's ASE. The team reports to Headquarters, U.S. Army Training and Doctrine Command (TRADOC), Fort Monroe, VA, through the Air Defense Artillery (ADA) School, Fort Bliss, TX. The team members are matrix support personnel from the Communications-Electronics Command, Fort Monmouth, NJ; the Missile Command, Redstone Arsenal, AL; and the ADA School. Although the ARAT personnel provide support to ADA and fire support systems, this article addresses the ASE elements.

What Does ARAT Do?

Every aviator engages in EC during combat and has the same goal: Survive! By monitoring all available information, the ARAT ensures ASE works in the EC environment. Thus, ASE must be reprogrammed with the most current threat information.

Correctly programmed, ASE detects, reports, and counters the threat operation. Ideally, ASE alerts the aircrew of the threat system in its "nonterminal" phases of detection, identification, and tracking. Once alerted, the aircrew's initial reaction time increases.

Reaction time is the interval from when ASE correctly identifies a threat to when a threat fires on its target. Increased reaction time provides greater chance of moving the aircraft out of the threat system's firing, launch, and intercept envelopes.

If the mission requires the aircraft to remain within the threat weapon system's firing and launch envelopes, the correctly programmed ASE will assist the crew with exiting the intercept envelope if fired upon.

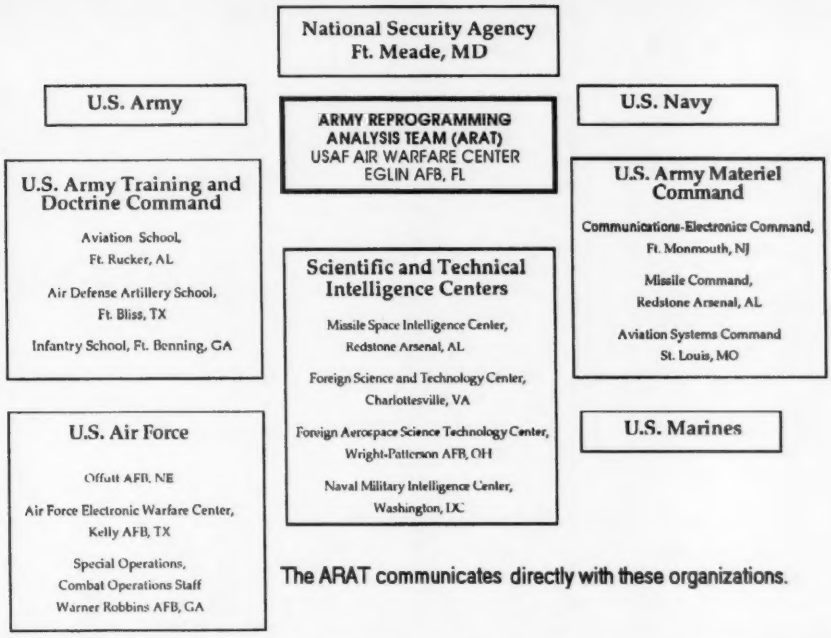
"Exiting the intercept envelope" in a tactical environment is, no doubt, an aviator's most thrilling (and life-threatening) experience. Developing tactics, techniques, procedures, and training to maximize the effectiveness of the exit maneuver, with a corresponding reduction in anxiety, will be the Aviation School's job.

Why An ARAT?

The ARAT is the first element in the reprogramming process. Reprogramming is the ability to rapidly change the ASE software threat identification parameters (and, in extreme cases, the algorithms themselves) to prevent changes in threat emitters from going undetected.

The ARAT members monitor the threat environment for indications of change, assess the detected change, and provide the system software and hardware developers with the updated parametric data necessary to counter the threat change.

Those who purchase personal computers know the state-of-the-art hardware seems to be forever flowing with something new appearing every few months. So it is with target engaging and target



The ARAT communicates directly with these organizations.

sensing systems. Threat system developers constantly are incorporating new technology into their systems to increase lethality. The "new" must be watched. Unlike purchasing a personal computer, we cannot just watch the capabilities develop. Detected changes must be studied and included in the threat system profile. Likewise, electronic countermeasures supporting these systems come in increasingly complex varieties.

Some target acquisition and tracking radars, for example, have dozens of operational modes. Each sensed mode must be identified, analyzed, and compared against the known threat information (called "parametric data") embedded in the target sensing software. ASE uses software algorithms to compare sensed versus embedded parametric data and perform the subsequent threat identification. The amount of parametric data required for the comparison, however, is immense.

Our current and projected ASE does not have the capacity to store every threat parameter required for identification and, in the case of jammers, engagement. Ensuring that the embedded threat contains the most current information, within the usual constraints of weight, space, and power, is a technical challenge. Reprogramming the ASE "memory" was determined the most effective way of responding to the challenge.

Where Is It?

The ASE personnel quickly realized the Air Force and Army Aviation elements were concerned with the same threat in the airspace above the battlefield. Rather than duplicate extremely expensive facilities already existing at the U.S. Air Force Air War Center (USAFAWC), the Army opted to work as a team with the Air Force at USAFAWC, a shared threat analysis environment.

The ARAT is collocated with the USAFAWC, Eglin AFB, FL. The ARAT advance party is on station at USAFAWC. The Memorandum of Agreement between TRADOC and Head- quarters, Tactical Air Command, has been signed. The interservice support agreement between Eglin AFB and the ARAT is coordinated and awaiting signatures. The target date for a fully operational team is 1 September 1992, but the advance party members are already providing support to the field in the form of threat analysis and target emitter identification.

Are There Any Questions?

The ARAT supports the aircrews by answering EC/ASE questions. If ASE works well, tell us about it. If anyone suspects ASE has threat detection, recognition, or operational limitations, tell us before enemy gunners dramatically prove it.

The ARAT POC is Norman Svarrer, acting chief, ARAT, P.O. Box 1523, Eglin AFB, FL 32542-0523; phone DSN 872-2166/ 8899/8919 or commercial 904-882-2166. ❐

Chief Warrant Officer 3 Ron Toth
C Company, 1-223d Aviation
Fort Rucker, AL

those doggone NOTAMs

Few things I have encountered during this tour have been as perplexing as dealing with the Notice to Airmen (NOTAM) system. I am sure numerous aviators deal with the system very little. For many of you, checking NOTAMs is simply a matter of checking the printouts in base operations. If that is all you are doing to check NOTAMs, you may not be getting the full picture.

For those who must rely on flight service stations (FSSs) for NOTAMs, the system changed somewhat on 18 October 1990. You should catch up with the changes. As an instructor pilot teaching visual flight rules (VFR) cross-country flights for the past 3 years, I have dealt with this system every day. Here is what I have learned about it.

There are still three types of NOTAMs as described in your general planning Flight Information Publication (FLIP) or Airman's Information Manual. Flight data center (FDC) NOTAMs primarily affect you on an instrument flight rule flight: *Distant (D)* NOTAMs . . . the bottom line on these is something could prevent you from being able to land at an airfield.

D NOTAMs and some *FDC* NOTAMs appear on the printouts at base operations. *Local (L)* NOTAMs usually deal with things such as construction, obstacles, or other information that would not prevent you from landing. One potentially important L NOTAM is "fuel unavailable," one good reason alone to check L NOTAMs.

Before 18 October 1990, it was important to look for the diamond symbol in Department of Defense (DOD) FLIP or what we called the "squiggly" in the airport facilities directory published by the National Oceanic Service. The presence of these symbols indicated the airport was part of the Federal Aviation Administration (FAA)/DOD integrated NOTAM system. This meant that you could call any FSS and receive D NOTAM information, for that airport, which was retrieved from the service A circuit. If the NOTAM were to remain in effect for a certain time period, it was removed from the service A circuit and placed in the biweekly NOTAM booklet. This practice is still being followed today.

Besides, D NOTAM information contained in the biweekly NOTAM publication was not, and is not, given to the pilot during briefings unless he specifically requested it. Therefore, if you do not have access to a current NOTAM booklet, you must ask the FSS briefer to check it for you for any

NOTAMs pertinent to your flight. This also applies to those who have the NOTAM boards in their base operations. If a NOTAM is in the book, it will not be on the printout. If you wanted L NOTAMs, or if the airport was not covered by the FAA/DOD integrated NOTAM system, you had to call the one FSS responsible for that airport's NOTAMs. You could not get NOTAMs from anywhere else.

The current NOTAM system is as follows: With the exception of the NOTAMs listed in the NOTAM booklet, D NOTAM information for *all* airports in the United States open to the general public can be retrieved from *any* FSS on the service A circuit. This makes the forementioned diamond or squiggly symbol obsolete. In fact, the symbol can no longer be found in the airport/facilities directory.

As an example, if I wanted to check D NOTAM information for the airport in Andalusia, AL, I would first check my unit operations for the current copy of the biweekly NOTAM booklet. If I did not have a current copy, I would inform the FSS briefer so that he could check it for me.

Next, I would check the printouts in operations, if available, or call any FSS. Call1-800-WX-BRIEF to reach an FSS in any state. To obtain NOTAM information for Andalusia, the FSS briefer would have to request weather information from the Anniston, AL, FSS. Why Anniston? Anniston is the FSS responsible for the Andalusia area.

Appended at the end of the weather will be all D NOTAM information for all the airports in Anniston's area of responsibility. Some FSSs also include their L NOTAMs, but they're not required to. To be assured of getting L NOTAMs, you must still call directly to the FSS responsible for the airport in question. Any other FSS will not have access to L NOTAMs for that airport.

One note regarding the biweekly NOTAM booklet: During the past 3 years, I have checked every issue. I have never seen a D NOTAM published in it. The booklet has contained only FDC NOTAMs. Nevertheless, the paragraph in the front of the booklet states: "NOTAM D information contained in this publication will not be found on the service A circuit and will not be given during pilot briefings unless specifically requested by the pilot." I, personally, would remove that statement from the booklet, relieving a pilot from the burden of checking this booklet unless he needed FDC NOTAM information.

If your destination is a military airfield, the situation can become more complex. In September 1989, I decided to take my students to Tyndall Air Force Base (AFB), FL, for VFR cross-country training. I called Dothan, AL, FSS for NOTAM information. The briefer told me no NOTAMs were published for Tyndall AFB for that day.

Later, after I hung up the telephone, it seemed peculiar to me that an AFB would have absolutely no NOTAMs. I decided to call Tyndall base operations to inquire about NOTAMs. The dispatcher read a list of seven or eight NOTAMs to include prior permission required only! I asked the dispatcher if those NOTAMs had been passed on to flight service. He responded that they had. I could not figure out what the miscommunication could have been.

Two days later, I obtained the August 1989 edition of the ***U.S. Army Flight Information Bulletin***. That edition stated that, if you are going to a military airfield, you must ask FSS for FDC NOTAMs. I immediately called Dothan FSS and talked to the same briefer who I had talked to when I first requested NOTAMs for Tyndall. When I asked for FDC NOTAMs, he pulled out the NOTAM booklet and started reading from it. I interrupted and reiterated I needed the NOTAMs from the "teletype." He said it would take a few minutes to look up the appropriate code. After several minutes, he returned to give me all of those NOTAMs that I had received at Tyndall.

On later trips to military airfields, I always had problems explaining to FSS personnel what I needed for FDC NOTAMs. Apparently, they do not get many requests for FDC NOTAMs except for what is provided in the NOTAM booklet. To solve this problem, I began carrying with me the code that FSS personnel would need to call up the NOTAMs. On several occasions, I actually read the code to FSS personnel over the telephone. The easiest way to get NOTAMs from a military airfield is to call them. Then you will not have to hassle with the FSS.

The NOTAM system is not as easy as many people think. You must have a fair understanding of the system to be assured of getting the information you need. It is not merely a one-stop deal even if you have the NOTAM board with the hourly updates available to you.

The bottom line is as follows: For D NOTAM information, check the biweekly booklet (just in case) and your NOTAM board (or any FSS for any airport). L NOTAMs still can be obtained only from the FSS responsible for NOTAMs for that airport; for military airfields, it is best to call them. ❐

NBC Decontamination

Lessons Learned

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This article is a compilation of three years' experience in training an attack helicopter battalion to survive on the nuclear, biological, and chemical (NBC) battlefield. It focuses on a crucial aviation problem—contaminated aircraft. The present threat of chemical warfare is as dangerous as ever. The conflict in the Persian Gulf shows the dangers of chemical weapons, and how they psychologically affect people, even when not employed.

I have included observations made during the decontamination training of an aviation unit, applying Field Manual (FM) 1-102, several articles written since 1986, and trial and error. I have listed these articles in the conclusion. These articles differ in their interpretation of FM 1-102 and the application of decontamination principles, but they have much to offer aviation and chemical units.

After completing chemical Officer Basic Course (OBC), I thought I was prepared for any assignment. I was en route to the 9th Infantry Division, Fort Lewis, WA, and a possible assignment to an infantry battalion.

The slot in the infantry unit had been filled by an OBC classmate who arrived several weeks before me. I was offered an assignment as a chemical officer for an aviation unit. I had a hard time looking disappointed. All this and AH-1 Cobras too; I became the first chemical officer of the 268th Attack Helicopter Battalion (AHB), 1-9th Aviation Regiment.

My arrival brought the NBC section to full strength—three people. From the outset, it was obvious there were things I had not been taught—I knew next to nothing about aviation operations.

The worst problem was a critical shortage of time. The 268th AHB had an externally evaluated Army Training and Evaluation Program (ARTEP) scheduled in 3 weeks at the Yakima Firing Center (YFC), Yakima, WA. All I had to do was be ready.

While we did pass the ARTEP, the evaluation gave me an insight into the problems of Army Aviation operating in an NBC environment. We spent the next 3 years trying to solve the problems identified during the ARTEP.

FM 1-102 gave us an excellent start, but it involved hauling much equipment. When the M13 portable decontamination apparatus (DAP) was fielded, we stumbled on an excellent means to decontaminate aircraft.

M13 DAP

The M13 DAP is an excellent decontaminate device and a much needed replacement/augmentation to the M11. However, it is a much more versatile device than was intended. Outfitted with a training canister, the M13 provides an excellent means to aid in the decontamination of aircraft.

Decontaminates such as decontamination solution number 2 (DS2) and supertropical bleach currently cannot be used on aircraft because of skin or component degradation from the caustic chemicals. The M13 and training canister can be used at aircraft decontaminate sites and forward arming and refueling points (FARPs), providing the FARP and decontamination personnel with an available, fielded system to decontaminate aircraft.

The soldier fills the M13's training canister with soapy water, a mild soda solution, or a mild chlorine solution that will remove contamination from an aircraft. He can then reach all areas of an aircraft using the wand and brush mechanism to scrub those areas clean. The M13 training canister can hold more solution than an M11 and does not slash about like an open bucket. The M13 helps

keep the soldier performing the decontamination drier, preventing mission oriented protective posture (MOPP) suit degradation. The M13 is also portable. It gives forward elements a hasty decontamination device with greater capacity. It can be carried in scout or lift aircraft to aid in decontamination if no decontamination site is available or to conduct aircrew spraydown if contaminated on the ground.

Hasty decontamination will not result in a MOPP-level reduction for the aircrew; however, it does allow the FARP personnel to protect themselves by cleaning the aircraft with which they come in contact.Using this system also prevents the use of flammable solvents, such as JP-4 being applied to an aircraft with rags or brushes for hasty decontamination. The fire hazard with JP-4 and static electricity is high. Using JP-4 in training poses severe safety hazards.

There are some drawbacks to the use of the M13 with training canister. It was not originally designed to decontaminate aircraft or equipment. In combat situations, M13s will go forward with DS2 canisters. There is always the chance that someone will pick up an M13 with DS2 and apply it to an aircraft. This application would disastrous for aircraft components and could render an aircraft inoperative—a costly mistake.

To prevent this mistake, the M13s with training canister must be well marked and kept separately. Personnel also must be trained in the use of both types of devices and know the limits of each. Good training on aircraft decontamination, at all levels of the organization, will prevent costly errors and make everyone conscious of the difference in the devices.

Another drawback of the training canister is that it is difficult and time consuming to fill. The interior lacks easy access and takes almost 5 minutes to fill. We found that some aircraft took one full container merely to spot decontaminate properly before entry into the FARP; two were the norm for hasty decontamination. An aircraft decontamination site or FARP would quickly exhaust their full containers, slowing the decontamination process.

The benefits of the training canister far outweigh the deficiencies. These deficiencies can be fixed with a minor modification and proper training. I think that any unit that may handle a contaminated aircraft should consider using the M13 DAP with the training canister. To this end, I submitted a product improvement (1 December 1988, *Proposed Modification to the M13 DAP Training Canister).* The U.S. Army Armament, Munitions, and Chemical Command, Aberdeen Proving Ground, MD, currently is reviewing my product improvement. The improvement is merely an addition of a gas cap-like device to the training canister to allow a much faster refill and a stronger soap or soda solution mix.

Aircraft Decontamination

This section details the use of the modified M13 DAP for hasty aircraft decontamination. It is designed to remove only the gross contamination and prepare the aircraft to enter the FARP and continue the mission. A hasty decontamination site is not intended to clean the entire aircraft. It is designed to clean those areas that the FARP personnel will handle to rearm and refuel the aircraft. It also should cover the aircrew entry points to ease aircrew decontamination after operations. After the battle, this decontamination site may move to a new location and set up for a deliberate decontamination, enabling a lowered MOPP level for aircrews.

When I left Fort Lewis, 1-9th Cavalry was working on a fixed site, deliberate decontamination. The aircraft would be shut down, handling wheels would be attached, and the aircraft would be rolled through the stations. This decontamination station requires a hard surface, such as a road or airfield. It will take more time, but it will allow for a more complete decontamination. In a desert environment, such as the National Training Center (NTC), Fort Irwin, CA, or Iraq, an unused road or airfield will be scarce.

It is important to remember that the principle of hasty aircraft decontamination is to remove gross contamination from the aircraft and allow the FARP personnel to handle the rearm/refuel mission without becoming contaminated. MOPP-level reduction may occur following hasty decontamination but will, in all likelihood, occur only after deliberate decontamination.

The station outlined here is one that we frequently used at the NTC and YFC. We allowed for four pads, but usually only two were used at any given time, switching to the right or left as the first became contaminated.

Set-Up

Once a decontamination site is chosen, it must be aligned and prepared for the incoming aircraft. Pad 1 is downwind, and Pad 2 is the upwind pad. Pad 1 will consist of at least four M13 DAPs outfitted with training canisters full of hot, soapy water. One roll of 100 miles per hour tape is needed at every

pad to tape the aircraft static ports and to seal the hoods, gloves, and boots of the MOPP gear for the decontamination crew. Even after using our wet weather gear during the decontamination process, I noticed that much dust from rotorwash had blown in my MOPP gear at those critical areas.

At least two soldiers are needed to operate the M13 DAPs at Pad 1. For safety, a team chief is needed to handle the aircraft and take all signals from the aircrew. He should stand near the front of the aircraft where he can watch the M13 operators closely. Rarely were all my decontamination crews aviation military occupational specialty-related. They had little experience around aircraft.

In addition, the aircrews have a difficult time watching the decontamination crews once they pass the cabin. The aircrews were much more comfortable with the training if someone was watching the M13 crews during the operation. If a chemical decontamination platoon will perform the decontamination, an aviation contact team should participate in the operation to guide the aircraft.

Pad 2 should be at least 150 meters upwind of Pad 1. The pads should not be more than 600 meters apart because of command and control problems. An M17 is next to Pad 2 on a 2.5- or 5-ton truck, or on the ground with a full blivet. Minimum personnel requirements for this station are a team chief to guide the aircraft, two people to operate the M17, and a guide for the hoses.

A rest and relief station should be placed at least 500 meters upwind and out of the aircraft flight path. An example of this station is in FM 1-102.

A makeshift windsock to test wind direction should be placed somewhere visible to the whole decontamination site and especially to the noncommissioned officer in charge. We usually flew our windsock from the top of the decontamination vehicle.

Actions

When an aircraft is reported inbound and less than 2 minutes out, the team chief for the first pad steps forward and pops smoke about 100 meters in front of his pad. This smoke marks the site location and the furthest point an aircraft should proceed without acknowledgment from the decontamination site. This smoke also gives the alignment for the decontamination site—the wind may have shifted since the morning's briefing or local winds may be different. Green smoke is used for "proceed," and red smoke is used for "remain in holding area until signaled." Another color should be used in training since red smoke signals real world emergency.

The team chief will take control of the first aircraft, using standard hand and arm signals. Aircraft 1 will hover over the pad, land, and immediately go to flight idle. The aircrew will give the team chief the thumbs-up signal when the aircraft is ready for decontamination. The next aircraft will remain in a holding area about 200 meters downwind of the smoke and remain there until signaled in by the team chief at station 1. (If station 1 is running two pads, the aircraft should enter the pads simultaneously and depart simultaneously to avoid rotorwash spreading contaminated material on a clean aircraft).

After the thumbs up is given and acknowledged, the team chief waves in the M13 DAP crews. The M13 crews approach the aircraft from the corners of the pad, at a 45-degree angle and fully visible to the aircrew and the team chief. They place tape over the static ports, forming an "X" with the tape. They usually put a small piece of acetate, plastic bag, or piece of tape at the juncture of the "X" to prevent the tape from fouling the static port.

The M13 crews then decontaminate the aircraft from top to bottom, front to back, avoiding areas beyond the exhaust. They pay close attention to the fuel port, ammunition bay doors, weapons pylons, and crew access. They do not spray water into the air intake but include it in the scrub-down. The area around the air intake is likely to pick up the most significant contamination because of the vacuum effect that the engines create in flight. Our practice was to ignore the tail boom entirely, allowing it to be washed in exhaust.

When the M13 crew finishes, they reverse their entry to the pad; they exit at a 45-degree angle to the front, always in full view of the aircrew and the team chief. They continue past the pad area about 15 meters so the aircrew can lift safely to a hover. The team chief gives the aircrew the thumbs-up signal when the decontamination crew is clear and signals the aircrew to bring the aircraft to a hover. He then steps aside, waving the aircraft through to the next pad. When aircraft 1 is clear, he signals to a waiting aircraft in the holding area. The aircrew brings the aircraft to a hover over Pad 1, and the decontamination team repeats the decontamination process.

The team chief at Pad 2, the M17 station, takes control of aircraft 1, and directs the aircrew to bring the aircraft to a hover. When it is safely down at flight idle, the aircrew signals the team chief to proceed. The team chief then signals the M17

crew to approach the aircraft. They enter the pad the same way as the M13 crews, from the front at a 45-degree angle. The crew then washes the aircraft, from top to bottom, front top back, using either steam or hot water. The crew avoids the same danger areas that the M13 crews avoided at Pad 1. The M17 crew can decontaminate more of the tail boom because of their longer reach; however, they still should avoid the tail rotor components, exhaust, and air intakes.

Aircrews should ensure that their windows are secure to prevent scalding water from entering the cabin during the wash. The M17 water pressure should not be above 50 pounds per square inch (psi). Water pressure above 50 psi may damage the aircraft.

The decontamination crew departs as they came, at a 45-degree angle to the front, and clears the pad. The team chief steps forward and spot checks the aircraft for contamination with M8 paper. If the aircraft shows no contamination, the team chief removes the tape covering the static ports and gives the aircrew a thumbs-up. If the aircraft is still contaminated, the team chief leaves the tape in place and takes the M17 team back in for a second wash.

M13 DAPs can be used at this station to spot decontamination, if necessary. The aircraft may have insufficient fuel to undergo the entire decontamination process a second time.

When the aircraft is clean, the team chief directs the aircrew to bring the aircraft to a hover. He then waves it through in the desired direction. At this point, both aircrew and team chief must ensure that the aircraft does not fly over the rest and relief station or any parked vehicles. Despite the aircraft being "clean," it still may blow contaminated debris about with its rotorwash.

The team chief should remain in constant contact with the aircrew and decontamination team and keep their attention during the decontamination process. He should inform the aircrew that he has removed the tape from the static ports and the old M9 paper. The team chief must observe closely the decontamination crews and the events at other pads. The aircrew also is responsible for watching for the decontamination crews, team chief, and other aircraft. They must inform the team chief of their fuel situation or maintenance problems, if necessary. Signals should all be according to the unit standing operating procedure (SOP).

The SOP should indicate who will replace saturated M9 paper on the aircraft. I recommend that the team chief remove the M9 paper at this station, and the aircrew replace it after the aircraft has dried en route to the next location.

Station Closeout

When the last aircraft has used the decontamination site and no more are expected inbound, the site must be closed out. The team chief will center himself downwind of his pad and use an M256 Chemical Detection Kit or Chemical Agent Monitor to check for vapor contamination. The decontamination crew will use M8 paper to check the pads and equipment for liquid contamination.

The area should be marked accordingly, equipment decontaminated as necessary, and the crews moved to the personnel decontamination site en route to the rest and relief station. Decontamination of the site's equipment may be needed, the M17/water truck decontaminates itself last. Even if no contamination is evident, the decontamination crew should be cautious when leaving the area. They should mark the area, unless they abandon it to the enemy. The area should be evacuated in an orderly fashion, avoiding the downwind areas.

Conclusion

I hope the information in this article proves useful to both aviation and chemical units. Our deactivation and the 9th Infantry Division's were disturbing events. Work that was accomplished and our lessons learned through trial and error appeared to be lost. I hope that is not so, and those who participate in this training will carry these lessons to other units.

FM 3-5 and FM 1-102 are excellent sources. Articles in the April 1986 ("Just Another FM?") and October 1987 ("NBC Defense in Aviation Operations") issues of the ***U.S. Army Aviation Digest*** provided good background material. The second article gave more detailed information on maintenance and survey. An article in the January 1991 issue of ***Chemical Review Professional Bulletin***, "Aviation Decontamination - Aviation Unit Considerations in an NBC Environment," gave good points on deliberate decontamination.

Chemical warfare is as real a danger today as it was 20 years ago. It becomes more dangerous as proliferation of these weapons continues. We must take care with training attention to detail. All aspects of NBC training should be incorporated into other training. NBC contamination must be treated as a condition of the battlefield, as it may yet become. ❐

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Flying High

A Look at Alcohol and Aviation

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Drinking and flying are two activities that should be kept as far apart as possible. Annually, Americans consume 5 billion gallons of beer, 400 million gallons of wine, and 430 million gallons of spirits. Aviation crews often use alcohol during off duty hours, either to aid relaxation or for personal enjoyment. In particular, alcohol is used frequently to fill the long periods of boredom while crews are on trips.

To most, it is acceptable to consume alcohol in moderation when operating power tools, driving a car, or simply getting by at work. However, consuming alcohol and then flying an aircraft cannot be tolerated. Before discussing alcohol and its effects on flying, let us review a few basic aspects about aviation.

For this article, I will group the aviation community in three basic categories—general aviation, commercial aviation, and military aviation. Each category is unique in terms of pilot performance, style, and operation. Alcohol consumption affects each category, but military aviation is perhaps the most prone to the many dangerous and hidden effects of ethyl alcohol.

This article focuses mainly on military and commercial categories since they have so many unique facets pertaining to aviation operations, safety, medicine, and policy.

General aviation

General aviation is largely the Cessna, the Piper, and the weekend flight hobbyist. This category suffers the highest percentage of known alcohol-related incidents, primarily because most of these flyers are not professional pilots or career pilots. The attitudes of these pilots may be less disciplined to the risks of alcohol and the residual side effects. Until recently, mass education about alcohol awareness has not been overstressed by the Federal Aviation Administration (FAA). A 1988 report on aviation accidents stated that as many as 10.5 percent of general aviation accidents may be attributed to alcohol impairment.[1]

Commercial aviation

Commercial aviation, particularly the airline industry, operates on a regimented pattern or routine. Flight schedules and overnight layovers usually are published 1 month in advance, as are assigned aircrews, flight times, and even mandatory offdays. Transporting passengers and cargo is one of the most demanding responsibilities in aviation. However, commercial aviation is straight and level flying that starts at point A and terminates at point B.

Military aviation

Military aviation involves flying high-performance, high-speed, state-of-the-art aircraft, which may be experimental. These aircraft contain sophisticated avionics, electronics, black box technology, classified equipment, and complex weapons delivery and detection systems. The flight environment is often chaotic, unpredictable, exhausting, and possibly hostile.

Military aviators are required to perform highly specialized, aerial maneuvers in a combat environment that exposes them to a variety of physiological effects. Some of these effects are excessive gravitational (G) forces (up to nine times the nominal standing rate), spatial disorientation (confusion about which end is up), vertigo (caused by revolving props and rotors and flicker of strobe lights), target fixation (fascination or hypnosis effect), hypoxia (oxygen deficiency), equilibrium imbalance, rapid decompression, fatigue, and motion sickness.

The unusual types of missions flown in the military also contribute to the overall complexity of pilot skills (*examples*: nap-of-the-earth (NOE); night vision goggle (NVG) operations; combat air assault; target acquisition and engagement; air-to-air countermeasures; missile evasion tactics; air intercept; in-air refueling; aerial reconnaissance; search and rescue; navigation in foreign (and hostile) territories; long-range, rapid deployment; and other covert missions. A pilot may be required to fly any of these missions with only a moment's notice or following prolonged periods of standby on alert status.

This lengthy list of military missions shows the diversification of military aviation. It also emphasizes the stressful and specialized requirements demanded of the military aviator. Military aviation requires aviators with superior intelligence, top physical conditioning, and a personal commitment to excel. If a pilot has even a slight alcohol impairment while performing these missions, the potential for a catastrophe is great.

Many people have an imaginary perception of a military pilot that glorifies the rough and ready, all-American ace who drinks at the bar until the early morning hours before the big mission. This perception is not entirely mythical. The belief that alcohol consumption is a part of military camaraderie is an accepted fact. Movies and television reinforce the stereotype image of the hard-drinking, hard-partying veteran of the skies, in the silk scarf, who always gets the job done and walks away from every ditched landing. The military of past contributed to this image with their "almost" mandatory happy hours to drink with the commander. The rationale for this image was to drink together, fly together, and fight together. Have any of you received low ratings on your annual evaluation because you did not attend the commander's wetdown?

During my 24 years as a helicopter crewmember, I have witnessed many alcohol-related safety violations. These violations seemed to be shrugged off as ritual behavior—you can do it, but do not get caught doing it. I recall how the clubs on base were packed each night during the Vietnam War era. The following morning, we would climb on a UH-1 Huey and look for the bad guys.

While this image may still linger, Army Aviation is now an entirely different ball game. Gone are the days of promoting or condoning excessive alcohol use in the military. I recently discussed alcohol and aviation with a senior flight surgeon at the U.S. Army Aviation Center, Fort Rucker, AL. He stated that, even on a Friday or Saturday night, the clubs are not operating anywhere near the levels they did 15 or 20 years ago. Alcoholic beverage cannot be purchased in many base stores until 5 p.m., and not when the person is wearing a military uniform.

Besides the change in attitudes, there has been a change in policy.

During the early 1980s, the military recognized alcohol as the leading substance of choice for drug abuse. Alcohol and drug abuse programs have been instituted within each branch of military service. Although drug abuse includes all forms of illicit and legal drugs, the aviation concern is directed predominantly toward alcohol. This concern is attributed to a psychological preconditioning ingrained in a person who wants to become a pilot. In short, a pilot is not likely to use "hard" drugs, because the individuals selected for training in these occupations tend to be motivated individuals, interested in staying healthy and alert. The incidence of illicit drug abuse within aviation is said to be almost nonexistent.[2]

Of all types of self-imposed stress factors, misuse of ethyl alcohol is unquestionably the leading cause of aviation accidents. Even while under slight influence, sound judgment becomes altered and aerial maneuvers may be attempted that usually would not be tried while a person is completely sober. A person under the influence of alcohol often will feel his performance is improving.

In March 1990, a commercial airline flight crew of three were arrested for flying while legally intoxicated. They landed without incident after flying a passenger loaded, Boeing 727 on a routine interstate flight. Witnesses reported that the crew were drinking the night before their 6 a.m. departure. Blood samples were taken and all three had a blood alcohol content (BAC) that exceeded 0.04 percent.[3] The airline fired the three pilots and the FAA revoked their license. Each pilot also received a prison sentence after being tried in a civil court. Another dramatic reminder was in 1977 when a DC8 crashed after takeoff and everyone on board was killed. The pilot's autopsy showed he had three times the BAC permitted for driving a car.

Alcohol's effects on the visual and auditory system are obvious. Alcohol impairs judgment, perception, discrimination, reaction time, mood, and motor coordination. It also disrupts a crewmember's performance by its detrimental effect on his quality of sleep. When introduced into the aviation environment, these effects can be greatly magnified.

Alcohol consumption slows a pilot's reaction reflex and affects his perception of time and distance, i.e., aircraft speed. An aircraft cruising at 120 knots will travel 200 feet in 1 second. A .5-second delay in a pilot's reaction time can equal 100 feet of lost real estate. This delay could be the critical difference between avoiding or hitting low power lines.

Combining alcohol and motion around the three axes of roll, pitch, and yaw adds further impairments, such as reduced tolerance to G forces, inner ear disturbance, spatial disorientation, reduced intelligence and sensory perception, central nervous system depression, and reduced brain cell activity to effectively use oxygen.[4]

The most prominent effect on the pilot is in the vestibular system, which is responsible for balance and sense of position, especially when the human system is exposed to motion. Studies conducted in aircraft simulators have shown that errors occur after drinking the equivalent of two cans of beer (*examples*: failure to manage switches properly, leaving landing gear in the retracted position during final approach, failure to recognize emergencies, and confusion over air traffic control instructions). In a controlled study involving actual flight, pilots with a 0.04 percent BAC showed highly degraded performance when executing instrument landing system approaches.

The residual effects of alcohol (hangover) may last up to 48 hours after the alcohol is consumed.

Besides alcohol's intoxicating effects during periods of measurable BAC, a pilot must be aware of the effects of flying with a hangover, even with 0.0 percent BAC. The term hangover does not simply refer to the period when a pilot is physically ill with a headache and nausea. The residual effects of alcohol (hangover) may last up to 48 hours after the alcohol is consumed.

A pilot with a hangover has a lowered altitude tolerance and is much more susceptible to hypoxia. This condition translates into dizziness and loss of motor coordination.

Some crewmembers try to reverse a hangover by taking cold showers, drinking black coffee, or breathing 100-percent oxygen.

These precautions have absolutely no effect because they do not speed up the body's metabolism of the alcohol already in the bloodstream. Metabolism is a natural process where enzymes in the body breakdown and convert ethyl alcohol molecules to waste.

One notable finding regarding effects of oxygen uptake is based on a 1936 altitude chamber study. This study showed that oxygen demand produced by alcohol intoxication can be counteracted by inhaling an enriched mixture of oxygen and carbon dioxide. Subjects who were given this concentrated mixture had significantly lower BACs than they did when breathing normal air.

In addition, performance tests administered under both sets of circumstances showed that the group using the enriched mixture fared considerably better in basic motor coordination exercises. This study concluded that an increase in oxygen and carbon dioxide appeared to reduce the effects of alcohol by lowering BACs and, therefore, lessened performance decrements.[5]

This oxygen countereffect must not be mistaken as a method of sobering an intoxicated person, nor does it have any effect on a individual with a hangover. This method ***only*** pertains to the alcohol plus altitude environment. It is important to point out that a combination of increased alcohol, with decreased oxygen (higher altitude), produced effects that neither could do alone. Furthermore, these effects are unlikely to be obtained at altitudes lower than 18,000 feet. On the ground or in the air, the ***only*** sure cure for a hangover is ***time***.

Aircrewmembers must be alert to the residual effects (hangover) of alcohol, particularly since equilibrium and balance may be affected for as long as 48 hours after consuming alcohol, and it has been totally eliminated from the bloodstream.

A unique form of military flying that has rapidly developed since the mid 1980s is night vision goggle (NVG) operations. Flying with NVG imposes several physiological disadvantages for a pilot, such as no depth perception, peripheral vision or coloration cues, and binocular vision. NVG flight operations are performed in conjunction with low-level/NOE flight during a prolonged period.

Another burden imposed by NVG operations is the additional 45 ounces the device adds to a flight helmet that already weighs 4 pounds. NVG flight operations are more stressful and fatiguing than flying under normal daytime conditions.

Alcohol will reduce a pilot's night flying performance in several ways. First, it induces a narrowed span of attention that makes concentration very difficult. Alcohol is a central nervous system depressant that creates a sedative effect.

Second, alcohol promotes visual fixation in which a pilot is likely to stare at objects and neglect proper night scanning techniques. Night vision uses receptor cells located in the outer portion of the retina called rod cells. Day vision relies on receptors called cone cells that are located in the central portion of the retina.

To gain maximum visual acuity under night conditions, a pilot must focus his sight 10 to 15 degrees off center from the viewed object. Proper night vision techniques while flying, especially at low levels, requires constant scanning from side to side, along the intended flight path.

A third alcohol-induced detriment to night vision is its effect on an individual's ability to produce or renew the pigment rhodopsin, also called visual purple. This photosensitive pigment enables the rod cells in the eye to function in dim light. For a healthy person, the eye can completely adapt to night vision conditions within 30 to 40 minutes. For a person who frequently and excessively consumes alcohol, complete dark adaption may take several hours, or it may never fully develop. The adverse effects of alcohol consumption may be further compounded if the person also is a heavy smoker.

Studies have been conducted that examined how alcohol consumption affects pilots, and how well pilots respond to air traffic controller instructions while performing routine flight duties. Piloting an aircraft is a complex processing function in which pilots must continually update and integrate information about aircraft systems, other traffic, weather conditions, and present position. All this information, and more, must be stored in a revolving mental model. Pilot performance depends on balancing available working memory capacity with task demands. Performance will decrease as total task demands overload the available working memory capacity. Communication is a difficult task that involves the transmission, reception, and comprehension of information. The communication process competes with other flight tasks for limited memory capacity.[6]

Alcohol reduces working memory capacity. It disrupts the brain's ability to divide and store attention between competing tasks, with the secondary task suffering more than the primary task. Radio communication during

flight will be especially impaired, because it imposes a large demand on working memory and comprehension. Alcohol consumption also will reduce the pilot's ability to understand and remember text. This disability hinders the pilot who is attempting to keep verbal information in working memory, integrating the information into his mental model, and maintaining control and course of the aircraft.

The effects of alcohol are not uniform. Different pilots will sacrifice different facets of their performance while impaired. In comparing communication with performance, most pilots will choose to assign a lower priority to the performance aspects of flight and focus their attention on communication tasks.[7] The errors that pilots have made most frequently while participating in a selected study were flying to incorrect altitudes and headings. These errors can occur because pilots confuse similar sounding numbers in aircraft call signs, radio frequencies, altitudes and headings, or they simply transpose numbers (example: "ARMY 903, ALTIMETER 29.95, SQUAWK 1425, FLY OUTBOUND, HEADING 250, CLIMB AND MAINTAIN 2,000, CONTACT DEPARTURE ON 242.25"). This pilot flew the outbound on a course of 200 degrees to an altitude of 2,500 feet and completely forgot the frequency. Imagine being 50 degrees and 500 feet altitude off course with no one to talk to, and that is only during departure!

Transportation errors demonstrate short-term memory impairment that is likely to occur most when pilots must remember two or more pieces of information in the same instruction. In the example above, alcohol not only impaired the pilot's ability to alter course and frequency as instructed, it magnified the severity of his errors so that he was far off his assigned departure. An error of 5 degrees and 50 feet can be called sloppy flying, but a 50-degree, 500-foot error is an obvious impairment.

Some other performance errors noted were near aircraft avoidance, detection of aircraft on horizon, maintaining proper vertical separation, aircraft systems emergency detection, drift and wandering during take off, lateral distance approach errors, and runway centerline position errors during landing.

As stated before, the physiological effects of alcohol are magnified with altitude. This strong interaction between alcohol and altitude has a compounding effect. (Example: The effect of 1 ounce of alcohol at sea level is physiologically equivalent to 2 ounces of alcohol at 10,000 feet.) Altitude can affect pilots by producing a hypoxic oxygen deficiency, whereas alcohol produces a similar effect known as histotoxic hypoxia. Either of these effects can cause reduced oxygen uptake to tissue cells in the brain and nervous system, which is additive when alcohol and altitude are combined.

Do you remember the phrase "bottle to throttle?" This phrase refers to the time span between the last alcohol consumed and stepping into the cockpit. An experiment using flight simulators and Navy pilots was performed to test for residual effects of alcohol. A precise pattern was designed to include routine and emergency procedures while in flight. The pilots were given 100 milligrams/deciliters (mg/dL) of alcohol between 5 and 7 p.m., equal to having five cocktails. At 9 a.m. (14 hours later), the pilots flew the simulated course. At that time, their BAC measured 0 mg/dL. A controlled group of pilots, who had no alcohol for the 48 hours before the experiment, also flew the course. The results showed pilot performance to be consistently worse for those with a hangover than for the control group, regardless of individual pilot flight experience or expertise. Though this experiment used significant amounts of alcohol, it emphasized that impaired pilot performance occurs even after all measurable levels of alcohol have been removed from the body.[8]

The military restricts flight duty for 12 hours following the last alcohol consumed and until no residual effects remain. As demonstrated in the above experiment, the 12-hour "bottle to throttle" regulation may be arbitrary and too lenient. Besides, the person making the decision as to whether any residual effects remain in his system is the least-qualified person to adequately judge his true condi-

. . . the physiological effects of alcohol are magnified with altitude.

tion—the pilot. How many pilots have you heard make this statement, "Sorry sir, I cannot fly this mission, I had too much to drink at the club last night."

Perhaps this 12-hour "bottle to throttle" regulation should be reexamined to establish a more defined time restriction. Worse yet is the FAA regulation that imposes only an 8-hour restriction after the last consumption of alcohol.

Aviation personnel must meet certain medical criteria that establish minimum fitness standards required for flight duty. Each rated individual in the military on flight status receives an annual flight physical from a qualified flight surgeon. Rated individuals generally include pilots, crewchiefs, air traffic controllers, and certain maintenance personnel. Besides the annual flight physical, aircrew personnel are observed by their commander for signs of alcohol and drug abuse.

Department of Defense (DOD) policy dictates that flight crewmembers involved in an aircraft accident or mishap be administered toxicologic tests to determine if alcohol or other drugs are present in the bloodstream. Current DOD policy further dictates that mandatory and unannounced drug tests can be given to DOD personnel.

If a crewmember is examined by a competent medical authority and the diagnosis shows alcohol abuse or dependence, the crewmember must be suspended from aviation duties. After successful alcohol rehabilitation, suspended aircrewmembers may be returned to flight duties with a waiver. However, this waiver is contingent on the follows conditions:

- The crewmember must be in an active, ongoing sobriety program.
- The crewmember must abstain from using alcohol.
- The crewmember must be supported by his commander and the medical authorities.

Alcohol rehabilitation can take from 3 to 18 months. With a waiver, 80 percent of suspended aircrew will eventually return to flight status.

These medical regulations are written to recognize that social drinking and moderation of alcohol are allowable, as long as the social drinker separates his leisure from his profession. Alcohol consumption should be regarded as an addictive and destructive habit. These regulations also provide that a medically competent diagnosis be made that will not needlessly end a pilot's career. Medical tests, such as a complete blood count and liver function analysis, will be made to support a clinical diagnosis. These regulations also are strict enough to provide a system for early detection of alcohol disorders. This policy establishes the means to prevent a situation from becoming a problem by identifying, treating, and returning useful aircrewmembers to the duties for which they were trained.

The current cost to train one U.S. Air Force fighter pilot is $1 million. This concern for our dwindling military resources is another reason to treat and cure alcohol problems whenever possible.

Last, regulations are intended to permanently rid the flight line of those who have lost control and responsibility for their actions, especially, when they jeopardize the lives, property, and aircraft for which they have been entrusted.

Current FAA regulations are implementing some major changes to identify alcohol abusers. Based on a National Transportation Safety Board report of recommendations, the FAA now has legislative authority to use the national driver register to identify airmen whose driver's license has been suspended or revoked for alcohol-related driving offenses. This course of action assumes that these driving offenses by themselves establish a behavioral pattern that will provide sufficient cause for denial or revocation of a pilot's certificate. This policy also can be used as a basis to alert aviation medical examiners to test the aircrewmember for detection and confirmation of alcoholism.

The aviation profession has its inherent risks. Danger may develop, in an instant, that will require a pilot to react without forethought. Increasing the probability for disaster through alcohol-induced human error will eventually prove to be a gamble that cannot be won. Remember, the mission you fly Monday morning may be when you settle your last bar bill! ❐

ENDNOTES

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The Aircrew Battle Dress Uniform

More Compatible For The Field

Captain Kenneth R. Keener
former Special Projects Officer,
Office of Deputy Assistant Commandant/
U.S. Army Reserve, Fort Rucker, AL

Aircrew Battle Dress Uniform With The SPH-4B Helmet

This uniform is more cockpit-compatible than uniforms previously worn by aviators. The top button is fastened, trouser legs are bloused, and sleeves hang straight down.

In 1975, the U.S. Army adopted the sage green CWU-27/P, U.S. Air Force (USAF) design, as the standard flight suit for its aircrews. Since the fielding began, the U.S. Army Aviation Center (USAAVNC), Fort Rucker, AL, has received several requests from tactical aviation units for a more field-compatible aircrew uniform.

In 1983, the commander, USAAVNC, directed his combat developer to start a requirement for a new, more field-compatible aircrew uniform to be the Aircrew Battle Dress Uniform (ABDU). The ABDU is similar in appearance to the Battle Dress Uniform (BDU) currently worn by U.S. Army, U.S. Marine Corps (USMC), and USAF personnel.

The ABDU design resulted in a two-piece, camouflaged, Nomex uniform worn by aircrews. The ABDU increases thermal protection and durability. The ABDU also provides the soldier flexibility to remove the coat or roll up the sleeves to reduce heat stress.

The ABDU increases the ease of body waste elimination and has additional pocket space. This uniform is also compatible with individual and mission tasks, Army aircraft, and aviation life support equipment.

The first few ABDU prototypes did not hold the camouflage overprint very well. The camouflage pattern faded after only a few washings, because the Nomex fiber does not have the same porous structure as cotton fiber.

In June 1986, U.S. Army Natick Research and Development (R&D) Center, Natick, MA, and private industry discovered a technological breakthrough for overprinting Nomex fiber.

The solution was to increase the thickness of the Nomex fiber while making it slightly more porous. This solution permitted the thicker Nomex fiber to keep the same flame retardancy of the thinner fiber. In addition, the solution allowed the ABDU to retain the camouflage overprint, even after several washings.

After conquering this problem, U.S. Army Natick R&D Center produced several hundred prototypes within 3 years. During this time, tactical U.S. Army Aviation and USMC armor units conducted several "customer tests."

As a result, the Departments of the Army and Navy adopted the ABDU design. The ABDU is now secures the trouser hand pockets.

Shirt and trouser bagginess caused a snagging hazard.

The manufacturer corrected this by removing excess material from the shirt sleeves and trouser legs. This does not eliminate the hazard for aviation maintenance personnel. To eliminate the snagging, maintenance personnel may tuck the shirt in, remove it, or become uniform smart and avoid the potential snagging situations.

Trouser legs could become snagged and present burn hazards. The trouser legs were consistently about 2 inches too short for secure blousing. The designers corrected this by increasing the trouser length, thus allowing the trouser legs of the ABDU to be bloused.

All flaps, adjustments, and closures not securely fastened presented snagging problems. The first prototypes had Nomex-velcro fasteners that decreased holding power. The holding power further decreased after a few washings. The developer used non-Nomex velcro with increased holding power. This corrected the problem.

The ABDU has undergone some ejection seat testing to determine if the ABDU would snag on any piece of equipment when the aviator ejects. The conclusions of the tests are insufficient at this time. Further testing is required before the ABDU is authorized for use in aircraft equipped with ejection seats.

Coping with technological breakthroughs, testing, budget cuts, redesign and reevaluation, the ABDU was a thoroughly tested uniform before fielding began in December 1991.

The first units to receive the desert ABDUs were the aviation units stationed in Turkey. The desert ABDUs are a solid tan color

Coping with technological breakthroughs, testing, budget cuts, redesign and reevaluation, the ABDU was a thoroughly tested uniform before fielding began in December 1991.

available in both woodland and desert camouflage patterns.

Other test units voiced concerns during the tests. The following are some discrepancies found during customer evaluations and corrective actions taken.

The left trouser cargo pocket could interfere with collective control movement.

Researchers solved this problem by sewing the flap and billows down on the pocket, making it nonfunctional. This was to maintain pocket appearance similar to the nonaviator BDU. Developers also removed the billows from the right trouser cargo pocket to prevent snagging.

Design of the shirt and trouser pockets permitted objects to fall out while soldiers were performing maintenance, preflight, flight, and post-flight duties. To correct this, designers installed a left sleeve pencil pocket and decreased the diameter of the pencil slot over the left breast pocket.

In addition, they added a vertical operating zipper to one side of the pencil pocket, allowing the wearer to carry additional items. Velcro

delivered at a cost of about $90 a set. The woodland camouflage ABDU is a four-color pattern at a price of $189 per set. The authorization to order these uniforms will be CTA 50-900.

These units were designated to receive the ABDU during the fall of 1992: 82d Airborne (Abn) Division (Div); 24th Infantry Division (ID) Mechanized (Mech); 48th Brigade (Bde) (Mech); 101st Abn Div (Air Assault); 7th ID (Light); lst Cavalry Div (Armored (AR)); 155th Bde (AR); 2d ID (Light); one armored cavalry regiment (ACR); and one AR in Europe (to be determined).

These units are designated to receive the ABDU during calendar year 1993: 25th ID (Light); 1st ID Mech; 5th ID (Mech); 256th Bde (AR); 4th ID (Mech); 3d ACR; 6th ID (Light); and 205th Bde.

With the exception of the round-out units, the U.S. Army Reserve and Army National Guard will get ABDUs after the fielding of active component units.

An ABDU flight jacket is under current design. There is not yet a projected fielding date or an estimated cost for this item. ❐

Friendly Fire

A Different Look

First Lieutenant Kenneth G. Moreno
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The subject of casualties suffered because of friendly fire during the Gulf War has resurfaced. It has been an issue that is difficult to comprehend, especially for those who lost soldiers, friends, or loved ones to the terrible reality of war. The intense strain of combat cannot be compared to any other experience in life. Unfortunately, the stress is extreme and may cause mistakes and accidents. It is difficult to accept the fact that friendly fire will continue to cause casualties; however, it is a fact of war. We must continue to seek the hardware and equipment that will

minimize this tragedy. Each soldier must rely on his training and experiences to make the right decision in these intense scenarios.

This article describes the events leading up to, and including, an actual combat mission conducted during Operation Desert Storm. It shows how even the best tactics, techniques, and procedures in training cannot always prepare you for the real thing. I will try to explain what helicopter crews do to ensure that friendly troops are not fired on.

Our unit, the 4th Battalion, 159th Aviation Regiment, is based in Stuttgart, Germany. The battalion has a headquarters and headquarters company that includes a fixed wing platoon; an aviation unit maintenance (AVUM) company; and UH-lH Iroquois, CH-47D Chinook, UH-60 Black Hawk, and OH-58D Kiowa companies. The battalion provides general, combat service, and combat support to the corps. The unique composition of the battalion, which performs various missions around the world, often requires it to be spread thin. An extreme amount of command and control is required to ensure the successful completion of every mission.

As a corps asset under the llth Aviation Brigade, in the OH-58D company, we often find ourselves attached to the AH-64 battalions within the brigade. This attachment essentially has become the standard for training and combat operations. Our OH-58Ds have worked with the AH-64 battalions during Return of Forces to Germany exercises, gunnery densities, and in all levels of collective training. During the corps' quarterly deep attack scenarios, the AH-64 battalions and the OH-58Ds train together. This habitual training has produced scout/gun teams that are lethal.

With the trend and necessity to fight at night, advanced sighting and designating systems have been developed and are continually being improved. The thermal imaging system (TIS) on the OH-58D and the forward-looking infrared (FLIR) system on the AH-64 offer the ability to improve our night fighting capabilities.

Scouts, aerial or ground, take pride in their ability to distinguish friend from foe. We study flash cards, slides, or field manuals to identify correctly vehicles and aircraft from many different countries. This training improves our ability to distinguish the type, origin, and the possible weapons combination that may be brought to bear on us. Even with this training, mother nature and the enemy can alter our ability to identify a vehicle. Let me explain.

On the dark and windy night of 26 February 1991, my platoon of OH-58Ds was attached to the 4th Battalion, 229th Advanced Attack Helicopter Regiment. Our mission was briefed in a holding area located in Iraq about 45 miles north of the Saudi Arabian boarder. The mission, as practiced so often in training, was to advance deep across the forward line of own troops (FLOT) to destroy an Iraqi armored unit in Kuwait. The briefings, map reconnaissances, routes, and engagement areas were straight forward and according to standing operating procedure. The thrill and apprehension of our first combat mission were there, but our mission was going just the way we had practiced. Nothing at the beginning of this mission surprised us.

At about 2145, we pulled pitch and departed the holding area in a modified wedge. We headed northeast at 100 knots and 30 to 50 feet above ground level (AGL). My OH-58D and the two AH-64 gunships were the second flight in one of the three AH-64 companies involved in the attack. We were responsible for the southern most part of the battalion's sector. To our north were the rest of the AH-64 company and the remainder of the battalion. Our southern side was considered enemy territory once we crossed the line of departure. The movement to the line of departure was uneventful, though our American forces were methodically destroying many Iraqi armor around us. Not until we saw the last friendly ground scout elements did we know exactly where the FLOT ended.

The 90 grid line graphically depicted our line of departure showing where the flight would switch to a passive mode of operation concerning some of our electronics. The line of departure also represented the transition point actively energizing our find, fix, and destroy detail. Intelligence had told us the Iraqi armor unit was about 100 kilometers (km) across the FLOT. No problem here, we trained and practiced to conduct deep operations repetitively between 100 through 150 km deep.

Not too long into our flight, radio traffic of teams assessing and engaging enemy forces and commanders receiving situation reports flowed over the battalion net, just like a training mission. Naturally, not all calls were in the standard format. Much chatter was heard—observers' and pilots' whooping, commanders' maneuvering teams into the engagement areas, and the distinct sound of certain exclamations describing how the turret of a tank suddenly departed its chassis. Then my team spotted an apparent Iraqi armored

column moving north. The column was only 200 meters past the 90 grid line! The bad guys were supposed to be ***deep***.

It was, however, a true scout/attack helicopter dream. The enemy were lined up in trail formation, just begging to be sacrificed for their country. Then we noticed something that we had not experienced in training. Peering through our night systems, we could see many tracked vehicles and tanks, but what kind? Something made these armored vehicles appear different. Our training had not put this element of identification into the equation.

This armored column was so close to the line of departure that the soldiers easily could have been friendlies that were disoriented or ordered beyond the briefed FLOT. Being the scout, I was sent forward to make a positive identification. As I moved closer to the armored column, the more frustrated my aerial observer and I became. Sure, this was known enemy territory; we had crossed the FLOT, but we had to make positive identification before we could launch a missile. An AH-64 crewmember stated that one vehicles looked like a "CUCV" (commercial utility cargo vehicle). Now many things were being factored together—the close location of the column to the line of departure, unclear silhouettes, and a possible friendly identification. Now what?

As I maneuvered closer, the problem became obvious. Each armored vehicle was covered with soldiers. No wonder the silhouettes appeared to be unusual. The troop-covered vehicles were a factor that we had not expected to encounter. Still, closer I crept to identify the vehicles. Now, instead of an entire vehicle's being available for identification, only the type of suspension and placement of the bore evacuator on the gun tube were in view.

Eventually, the suspected Iraqi soldiers heard the helicopters. They immediately jumped off the vehicles. At last, a clear view of the tanks and the multirole, tracked vehicles (MT-LBs) appeared. All vehicles now were positively identified as enemy. My aerial observer requested two missiles, one on our laser code and the other on the AH-64s.

The AH-64 crewmembers told us to move back—we were too close to the armored column for them to fire a missile. Getting caught up in the moment, I had maneuvered dangerously close. I immediately backed off and set up in an observation/designation point. Three tanks, six MT-LBs, and a commercial truck that appeared to be a Toyota were destroyed.

In reviewing the recorded tapes, I maneuvered so close it appeared that my aircraft was part of the armored column. Of course we had the comfort of supporting fires from the AH-64s, but we put ourselves in jeopardy to ensure that the vehicles we were about to destroy were the enemy.

Many suggestions have been made on how to eliminate the possibility of fratricide. One suggest is the placement of rotating infrared beacons on vehicles. This solution would present problems to all that fly or drive using night vision goggles (NVG), and the enemy can place infrared beacons on their vehicles.

Perhaps an identification friend or foe (IFF) system, as used on aircraft, would be effective. This solution would require retrofitting all vehicles and aircraft with like interrogation and response devices. Even then, we become dependent on the electronic reliability of the equipment. Also, infrared or thermal tape applied to vehicles may not be effective. Though they may work for TIS or FLIR systems, they are ineffective for NVG.

Helicopter crews go to great lengths to be absolutely positive that the vehicles in their sights are the enemy before they shoot or request missiles. Every situation is different. Even the best-trained crews cannot foresee every contingency. No one wants to shoot friendly troops or vehicles. When a vehicle is in our sights, and the system has it locked in, the thought of fratricide goes through our minds. Many factors must be considered before firing. During our mission, many of these factors were not anticipated, nor previously encountered by the team. Unlike training, these bullets and missiles were real, and we were playing for keeps.

As aviators, we know what it is like to have to rely on others for positive identification. The threat of friendly fire from our own air defense artillery goes through our minds. Often, talk around the tent describes "somewhere sits a private first class, scared and tired, in a foxhole, manning a STINGER, ready to shoot down anything that crosses his path." Let us hope he has this aircraft identification thing down to a science.

Every possible effort is made to ensure that positive identification is made before firing on any vehicle or personnel. There may never be a "rock-solid" solution to this problem, other than the total abolition of war itself. Until that time, we must rely on training, the systems provided us to fight with, and our own abilities to make sure that the target in our sights is the enemy. ❐

Close Calls

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Accidents due to mechanical failure and weather are on the decline. Accidents involving human error are not decreasing. Unless human errors can be reduced, the number of close calls and actual aircraft accidents will continue to increase.

A good program, using cockpit resource management (CRM) techniques, can help reduce accidents or incidents. This type of program can help reduce accidents involving problems with decision-making, pilot judgement, leadership, communications, and crew coordination.

Can you honestly admit that you have not had a close call caused by a shortcoming in CRM? The goal should be to eliminate as many close calls as possible by using good CRM techniques.

The following story, a short excerpt from early in my career, took place in the fall of 1971. The day was typical for Vietnam, hot, muggy, and mosquito-ridden. We started our approach into a landing zone (LZ) in the Plain of Reeds, near the Cambodian border. Our aircraft was flying trail, in a flight of four UH-1H Iroquois "Slicks" filled with South Vietnamese infantrymen. Our objective was to secure the LZ for a larger force later in the day.

The approach was uneventful, but as the troops began exiting the aircraft, we noticed the water was much deeper than previously reported. Several heavily equipped soldiers were immediately in serious danger of drowning. At the same moment, I noticed the first three aircraft were empty and had started their takeoff.

This period is when the first break-down in communication took place. Our crew was busy formulating a plan to pull drowning soldiers out of the LZ. No one called the other aircraft for help. Our aircraft quickly filled to overcapacity and started to settle into the water. Now we faced the possibility of the entire aircraft sinking. The main rotor blades could pulverize many soldiers in, on, and around our aircraft. Little did they realize that their safe haven was in desperate trouble.

The aircraft commander attempted in vain to save the situation. He pulled in all the power the overloaded aircraft could muster. The UH-1H lumbered slowly upward and started pitching nose down. At 50 feet, the nose exceeded a 90-degree nose low attitude and crashed inverted in about 10 to 15 feet of water.

The second breakdown in communication soon surfaced. As a crew postcrash procedures had not been briefed. After what seemed an eternity, I finally escaped from the aircraft. I also dragged a soldier from the cockpit and took him to the surface. When we surfaced, none of the crew was in sight. Twice I went back down to search for survivors, with no luck. Completely exhausted, I surfaced again to see three tired and worried faces. We had been alternating dives looking for each other and doing nothing.

The moral to this story is that the importance of proper communication cannot be overstated. The entire plan must be communicated and understood by everyone involved; yet not everyone may understand fully the communicative process. First, the communicator must formulate the desired message. The message must be transmitted in clear, concise, and easily understood language. The receiver must listen carefully, decode the message, and respond correctly, the first time.

The four Cs to CRM are invaluable tools to help reduce errors in human judgement—

- ***Coordination*** of crewmember responsibilities.
- ***Cooperation*** between crewmembers to attain maximum effectiveness.
- ***Cockpit teamwork*** to ensure individuals work together toward a common goal.
- ***Common phraseology*** or standard use of terms, avoiding slang and easily misinterpreted wording.

If your crew can employ some of these techniques, they might help reduce close calls and accidents. CRM will work, if you give it the time and effort! ❐

Test Community Celebrates Aviation Anniversary

by Mr. Robert J. Szersynski

As Army Aviation celebrates its 50th anniversary, the Test and Experimentation Command (TEXCOM) Aviation Test Directorate, Fort Hood, TX, reflects on its significant contributions to the development of Army Aviation for the past 82 years.

The father of aviation testing in the U.S. Army is Lieutenant (LT) Benjamin D. Foulois. The U.S. Army sent LT Foulois to Fort Sam Houston, TX, to conduct tests and evaluate the usefulness of the first Wright Brothers' aeroplane, known as "Old Number One." LT Foulois completed his first solo flight on 2 March 1910.

After completing his first flight, LT Foulois told news reporters, "I am not here to give exhibition flights or to break records made by other aviators, but simply to try out the machine and see what can be done in case of war, as an aide to the Signal Corps. My experiments will cover a wide range and will continue at Fort Sam Houston for some time to come."

For more than eight decades Army Aviation testers have been on the leading edge of aeronautical technology looking for a better way—searching for the truth. From those early days with Old Number One, to the monoplane in the 1920s; the autogiros in the 1930s; to the XR-4 Hoverfly helicopter in the 1940s; the H-19 Chickasaw, H-21 Workhorse, L-20 Beaver, T-37 Dragonfly, and aircraft armament in the 1950s; to an evaluation of jet aircraft that included the Fiat G-91, Northrop F-5 Freedom Fighter, and Douglas A4D-2N for an Army close air support airplane and the development of the airmobile concept in the 1960s; to the high-tech expansion in military aeronautics in the last three decades; Army Aviation testers have been working diligently to keep Army Aviation "Above the Best."

The TEXCOM Aviation Test Directorate can be traced back to the formation of Army Ground Forces Board Number 1 on 1 October 1945, with the inclusion of an Air Support Service Test Section at Fort Bragg, NC. Designations and locations have changed as Army Aviation grew.

The current alignment began on 16 November 1990, when the Secretary of the Army announced the streamlining and consolidation of operational testing activities because of the Defense Management Review and Army Management Report. This reorganization merged the Operational Test and Evaluation Agency (OTEA), TEXCOM, and the eight U.S. Army Training and Doctrine Command test boards, including the U.S. Army Aviation Board, Fort Rucker, AL, to form an Operational Test and Evaluation Command (OPTEC), with headquarters in Alexandria, VA. OPTEC has an Operational Evaluation Command collocated with the headquarters in Alexandria and TEXCOM at Fort Hood. The Aviation Board became the TEXCOM Aviation Test Directorate and was moved to Fort Hood.

The mission of the TEXCOM Aviation Test Directorate was, is, and will continue to be the operational testing of new equipment, training, tactics, and doctrine for Army Aviation. The directorate recently completed tests on a mobile microwave landing system and is currently conducting the air-to-air combat force development test and evaluation. The directorate also will test candidate aircraft for a new training helicopter to be used as a primary flight instruction platform.

From the early days of testing the aeroplane in 1910 to the future with the RAH-66 Comanche helicopter, the Aviation Test Directorate will continue to be an important element of Army Aviation.

Mr. Szerszynski is assigned to the Aviation Test Directorate, TEXCOM, Fort Hood, TX.

Test and Experimentation Command

Readers may address matters concerning test and experimentation to: Headquarters, TEXCOM, ATTN: CSTE-TCS-PAO, Fort Hood, TX 76544-5065

Aircraft Call Signs

by Mr. Richard T. Johnson

The use of unauthorized aircraft call signs in the air traffic control (ATC) system by the military services is increasing. Several ATC facilities have reported problems identifying abbreviated, unassigned military call signs.

Specifically, units are arbitrarily making up call signs and then abbreviating them to stay within the seven alphanumeric character limit required by Army Regulation (AR) 95-2 (example: "Bluwlf 4" [Bluewolf 4] or "SHDO 5O"[Shadow 50]). Officially authorized call signs must consist of a combination of complete words and their numerical suffixes. Obviously, the use of unauthorized call signs is prohibited.

Unauthorized call signs include words that might have racial or sexual implications. The use of such call signs by Army aviators will not be tolerated. Every member of the Army Aviation community must prevent inadvertent or thoughtless use of terminology that is not consistent with the Army's program of fair and equal treatment and the elimination of sexual harassment.

In all fairness, we must tell you that we have not been notified of any similar problems with call signs within Army Aviation. Let us continue to keep our record clean!

There are two types of special call signs that can be authorized: tactical and nontactical. Each call sign has a different purpose.

. . . the use of unauthorized call signs is prohibited.

Tactical call signs are to be used strictly in local areas or on special missions for internal unit control purposes. They may not be used in the ATC environment and may not be submitted on a flight plan for flight through the national airspace system. Major Army commands have the authority to issue tactical call signs.

Nontactical call signs are used by Army Aviation units operating in congested air traffic areas. The assignment of this type of call sign is based on the determination that its use would be clearly beneficial to operational needs. These call signs are listed on flight plans. The Director, U.S. Army Aeronautical Services Agency, Alexandria, VA, approves nontactical call signs for most parts of the world. The Commander, U.S. Army Aeronautical Services Detachment, United States Army, Europe, approves call signs for Europe, Africa, the Middle East, and Southwest Asia. See AR 95-2 for complete details.

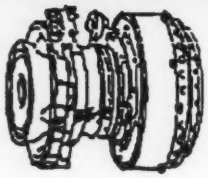
Most units, however, will be required to use the standard call signs described in the Department of Defense flight information publication General Planning document, chapter 4.

The arbitrary use of an unauthorized or abbreviated call sign without proper coordination and approval could duplicate a valid assignment to another unit within the same air route traffic control center. Further, it could result in confusion and jeopardize flight safety.

Mr. Johnson is an Aeronautical Information Specialist, Aeronautical Information Division, U.S. Army Aeronautical Services Agency, Alexandria, VA.

U.S. Army Aeronautical Services Agency

USAASA invites your questions and comments and may be contacted at DSN 284-7773/7984 or write to: Commander, U.S. Army Aeronautical Services Agency, ATTN: MOAS-AI, Cameron Station, Alexandria, VA 22304-5050.



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Mystery or Magic?

by Mr. Dave Fonda

Many in the Army Air Traffic Control (ATC) community believe the ATC acquisition process is broken. Rightfully so, the last piece of tactical ATC equipment fielded was the AN/TSW-7A visual control facility, fielded in 1982. The AN/TPN-8/TPN-18 ground control radar set has been in the field since the early 1950s. Most of the Army's tactical ATC equipment used in support of today's highly mobile AirLand Operations concept has far exceeded its life cycle expectancy. Fixed-base ATC radar and communications equipment is tube-type technology, and it also has exceeded life cycle expectations. Tactical equipment and fixed-base ATC equipment have become labor intensive and sustainment costs have risen dramatically. Unfortunately, we in the acquisition community did not replace old and antiquated ATC equipment. However, the future looks good, but we must be patient. New equipment does not appear overnight.

Because of Operation Just Cause and Operations Desert Shield and Desert Storm, ATC equipment deficiencies are now identified in the battlefield development plan. An effort to pursue a nondevelopmental item approach for new tactical and fixed-base ATC equipment is ongoing in the requirements and acquisition communities. This type of acquisition strategy will streamline and speed the acquisition process.

The Product Manager for ATC (PM-ATC), U.S. Army Materiel Command, Alexandria, VA, was established in December 1990. It resides at the Aviation Systems Command, St. Louis, MO. PM-ATC serves as the materiel developer for all tactical and fixed-base ATC acquisitions. U.S. Army Air Traffic Control Activity (USAATCA), Fort Rucker, AL, is the requirements developer for all tactical and fixed-base ATC equipment.

In February 1991, the Under Secretary of Defense for Acquisition approved and signed Department of Defense Directives (DODDs) 5000.1 and 5000.2, which provide basic policies governing defense acquisitions. The new "5000 Series" provides a single, uniform acquisition system for all DOD acquisition programs. For the first time, an attempt is being made to forge an interface between the requirements generation phase; the acquisition management system; and the planning, programing, and budgeting system.

All DOD acquisition programs are based on an identified mission need or deficiency. Mission needs must be evaluated first to determine if they can be satisfied by nonmateriel solutions. (Nonmateriel solutions include changes in doctrine, operational concepts, tactics, training, or organization.) If they cannot, a materiel requirement is initiated for the deficiency.

The user, major Army command (MACOM), requirements developer, or materiel developer usually identifies the deficiency or need. Top driven programs for the life cycle replacement are initiated by a life cycle manager through the requirements developer. Requests for replacement of specific fixed-base ATC equipment are submitted by the user, through the MACOM to USAATCA. USAATCA validates the requirement according to Army Regulation 95-2, ATC, Airspace, Airfields, Flight Activities, and Navigational Aid, chapter 14.

After the requirement is validated, the requirements developer prepares a mission needs statement (MNS). The MNS is a broad statement of mission needs expressed in terms of operational capability, not a system-specific solution. It is staffed and approved by the U.S. Army Training and Doctrine Command, then forwarded to Department of the Army, Office of the Deputy Chief of Staff for Operations and Plans (ODCSOPS) for validation. The validated MNS and associated catalog of approved requirements document number authorize the requirements developer to proceed with the development of the operational requirements document (ORD).

The ORD also is prepared and developed by the requirements developer for the most promising systems concepts according to DODD 5000.2. This document is the bridge connecting the MNS to the acquisition program baseline and specifications for the concept or system. At each milestone decision point, it reflects the current state of evolutionary requirements definition.

The Directorate of Combat Developments, Fort Rucker, and Systems and Plans Division, USAATCA, developed MNSs for the terminal tactical control system (TTCS) and the air traffic navigation, integration, and coordination system (ATNAVICS). The TTCS replaces the AN/TSQ-97 manportable control equipment that was designed for use at landing/drop zones. The ATNAVICS replaces the AN/TSQ-71B landing control central, a tactical radar that provides all weather precision approaches.

The Requirements Division, USAATCA, developed and forwarded MNSs to ODCSOPS for validation to replace the fixed-base precision approach radar (PAR) system, low activity tower console (LATCON) communications system, recorder/reproducer, and precision and nonprecision ATC landing system. These MNSs are the first step in the acquisition process and probably will take about 6 months to validate. The ORD goes through the same process, so we can expect an approval in the same period (6 months).

Milestones have been developed for the TTCS and ATNAVICS. The first unit equipped for TTCS is

scheduled to be fielded in fiscal year (FY) 95 and ATNAVICS in FY 97. Fixed-base ATC systems should come online beginning in FY 94 for recorders, FY 95 for the LATCON, and FY 96 for the PAR.

There is no mystery about how the acquisition process works. No magic is involved when a new piece of equipment is acquired. It is, however, a process involving a close relationship with the user, requirements developer, and the materiel developer.

Mr. Fonda is Chief, Requirements Division, ATC Development Office, U.S. Army Air Traffic Control Activity, Fort Rucker, AL.

U.S. Army Air Traffic Control Activity

Readers are encouraged to address matters concerning air traffic control to: Commander, USAAVNC, ATZQ-ATC-MO, Fort Rucker, AL 36362-5265.

Aviation Personnel Notes

Aviation Branch Insignia

When the Aviation Branch was established in 1983, many commissioned and warrant officers felt that it was appropriate to recognize the aviation warrant officer as an integral part of the branch. As early as 1984, efforts were underway to allow aviation warrant officers to wear the Aviation Branch insignia instead of the traditional warrant officer insignia.

This issue expanded beyond the scope of the branch to include all Army warrant officers because of the provisions of AR 670-1. The prevailing opinion was that, if Aviation Branch warrant officers wore their branch insignia, all warrant officers would have to wear their respective branch insignia.

This issue was included in the Warrant Officer Leader Development Action Plan that was briefed to the Chief of Staff of the Army on 18 February 1992. His decision was to retain the traditional warrant officer insignia.

The policy in AR 670-1 that specifies the wear of the warrant officer insignia remains valid. All aviation warrant officers, commissioned or not, will continue to wear the warrant officer insignia and accoutrements. Aviation warrant officers are not authorized to wear any branch insignia. Warrant officers should ensure that their official Department of the Army photograph has the warrant officer insignia.

Aviation Proponency Office

Readers may address matter concerning aviation personnel notes to: Chief, Aviation Proponency Office, ATTN: ATZQ-AP, Fort Rucker, AL 36362-5000; or call DSN 558-5706/2359 or commercial 205-5706/2359.

U.S. Army Class A Aviation Flight Mishaps

Fiscal Year	Number	Flying Hours	Rate	Army Fatalities	Total Cost (in millions)
FY 91 (through 30 June)	41	957,809	4.28	38	$144.0
FY 92 (through 30 June)	17	968,497 (estimated)	1.76	9	$59.0

* U.S. G.P.O.:1992-631-011:60003

Are We Really Qualified?

by Sergeant First Class (SFC) Lawrence F. Dunn

The sound of the turbine engines and the turning rotors is gratifying when I know that I made it happen. I could do this for the rest of my life. But, am I as qualified as my civilian counterpart?

Does this sound like you? If it does, pay close attention. You may gain some valuable knowledge.

As aircraft maintenance soldiers, we do the same functions as our civilian counterparts with few exceptions, but we are different. The Federal Aviation Administration (FAA) certifies civilian aircraft mechanics by giving them airframe and powerplant (A&P) license.

How do we get an A&P license? Are we really qualified? A quick review of Federal Aviation Regulation, Part 65, Subpart D, will tell you that most aviation maintenance soldiers are qualified.

I will give you a short overview. If your military occupational specialty (MOS) is 67, and you have 18 months' experience in airframe maintenance and 18 months' experience in powerplant maintenance or 30 months' combined experience, you are eligible for both the A&P license. Personnel in MOS 68B who can prove they have 18 months' experience in powerplant maintenance are eligible to attain a powerplant license.

What process do we use to start our testing? A little preparation would not hurt. The study text/guides for the general, airframe, and powerplant examinations are available at most bookstores. If the books are not on hand, the bookstore manager will gladly order them.

When you feel you are ready to take your written examinations, contact your local General Aviation District Office (GADO). The representative will tell you the type of documentation you will need for your permission (mother-may-I) slips. Usually, a copy of your Department of the Army Form 2-1 or a Department of Defense Form 295 is acceptable.

Some GADOs give the written examinations at their facility. If you are too far away, the representative will give you the name of a local written examiner.

You should not take more than two examinations at a time. Each examination takes up to 3 hours to complete. You will be required to take your general section examination before you take the airframe or powerplant section examination.

After taking your written examination, the results should be mailed to you within 30 to 45 days. Do not get too excited; it is not over yet. Although you passed your written examination, you are not out of the woods. You must pass your oral examination and practical examinations to get your license.

A designated mechanic examiner (DME) must administer your oral and practical examination. To locate a DME, you should contact the GADO. GADO keeps a roster of DMEs in your area.

Sometimes, the DME will provide training during the testing session. Do not take this testing lightly. Soldiers are accustomed to turbine engines with metal airframes. You are in for a surprise. This test will include dope and fabric and reciprocating engines.

Upon passing your written, oral, and practical examinations, you will receive a temporary airframe and/or powerplant license. The original will be mailed to you from the FAA, after the DME files your test results.

As you have probably noticed, no dollar signs were mentioned in this article. The prices vary from place to place. Check with the GADO for the price of the written examination. The prices charged by the DMEs will vary from individual to individual.

If you have any further questions, your local library will have Code for Federal Regulations, Title 14, Book 2, Aeronautics and Space, which will provide detailed information.

SFC Dunn is the Training Development Noncommissioned Officer, Enlisted Training Branch, Directorate of Training and Doctrine, U.S. Army Aviation Logistics School, Fort Eustis, VA.

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U.S. Army Aviation Digest Professional Bulletin
U.S. Army Aviation Center
ATTN: ATZQ-PAO-AD
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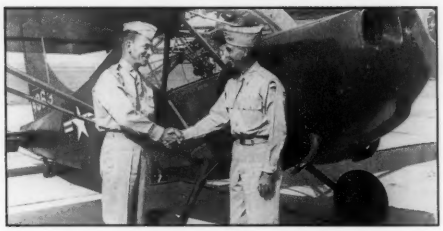

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From 5 through 9 October 1992, the U.S. Army Aviation Center, Fort Rucker, AL, will host the Fifth Annual Aviation Noncommissioned Officer (NCO) Symposium at the NCO Club. The theme for this year is "Aviation: Designing the Enlisted Force for the Future."